AD A091278

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Fresh Air Fund Dam
Dutchess County

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report provides information and analysis on the physical condition of the dam as of the report date. Information and analysis are based on visual inspection of the dam by the performing organization.

The examination of documents and visual inspection of the Fresh Air Fund Dam No. 1 and appurtenant structures did not reveal conditions which constitute a hazard to human life or property. The dam, however, has a number of problem areas which require remedial action. These areas are listed below.

The discharge capacity of the spillway is inadequate for all flows in excess of 85% of the PMF (Probable Maximum Flood). The spillway is therefore, assessed as inadequate.

Within 1 year of notification to the owner the following remedial actions or repairs must be completed:

1. Monitor the seepage, observed near the left abutment beyond the toe of the dam, at bi-weekly intervals.

2. Repair the deteriorated bituminous coating of the service spillway pipe after removal of rust. Also repair the cracked concrete headwall at the outlet of this pipe.

3. Remove the debris on and within the service spillway intake chamber. Monitor periodically for future debris collection, and clean as required.

4. Remove the vegetation at the locations described in this report. Provide a program of periodic cutting and mowing of these surfaces.

5. Backfill the depressions observed beyond the downstream toe of the embankment, and monitor the area for the development of additional depressions.

6. Provide a program of periodic inspection and maintenance of the dam and appurtenances, including yearly operation and lubrication of the reservoir drain system. Document this information for future reference. Also develop an emergency action plan.

A091278

(6)

LOWER HUDSON RIVER BASIN

National Dam Safety Program

FRESH AIR FUND DAM,

Site 1 (DEER LAKE). (Inventory Number NY 288), Lower Hudson River Basin,

DUTCHESS COUNTY, NEW YORK.

~~INVENTORY NO. N.Y. 288~~

PHASE I INSPECTION REPORT,

~~NATIONAL DAM SAFETY PROGRAM~~

(11) 30 Sep 80

(12) 172

(10) George / Koch

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CONTRACT NO. DACW51-79-C-0001 (15)

NEW YORK DISTRICT CORPS OF ENGINEERS

JULY, 1980

393770

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PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I Investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through frequent inspections can unsafe conditions be detected and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aide in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
FRESH AIR FUND DAM I.D. No. NY 288
DEC #212D-1528 LOWER HUDSON RIVER BASIN
DUTCHESS COUNTY

TABLE OF CONTENTS

APPENDIX

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

Name of Dam:	Fresh Air Fund Dam No. 1 (Deer Lake) (I.D. No. NY 288)
State Located:	New York
County Located:	Dutchess
Stream:	Unnamed tributary of the Fishkill Creek (tributary of the Hudson River)
Date of Inspection:	July 9, 1980

ASSESSMENT

The examination of documents and visual inspection of the Fresh Air Fund Dam No. 1 and appurtenant structures did not reveal conditions which constitute a hazard to human life or property. The dam, however, has a number of problem areas which require remedial action. These areas are listed below.

The discharge capacity of the spillway is inadequate for all flows in excess of 85% of the PMF (Probable Maximum Flood). The spillway is therefore, assessed as inadequate.

Within 1 year of notification to the owner the following remedial actions or repairs must be completed:

1. Monitor the seepage, observed near the left abutment beyond the toe of the dam, at bi-weekly intervals.
2. Repair the deteriorated bituminous coating of the service spillway pipe after removal of rust. Also repair the cracked concrete headwall at the outlet of this pipe.
3. Remove the debris on and within the service spillway intake chamber. Monitor periodically for future debris collection, and clean as required.
4. Remove the vegetation at the locations described in this report. Provide a program of periodic cutting and mowing of these surfaces.
5. Backfill the depressions observed beyond the downstream toe of the embankment, and monitor the area for the development of additional depressions.
6. Provide a program of periodic inspection and maintenance of the dam and appurtenances, including yearly operation and lubrication of the reservoir drain system. Document this information for future reference. Also develop an emergency action plan.

George Koch

George Koch
Chief, Dam Safety Section
New York State Department
of Environmental Conservation
NY License No. 45937

Approved By:

Colonel W. M. Smith Jr.
New York District Engineer

Date: 30 Sep 80

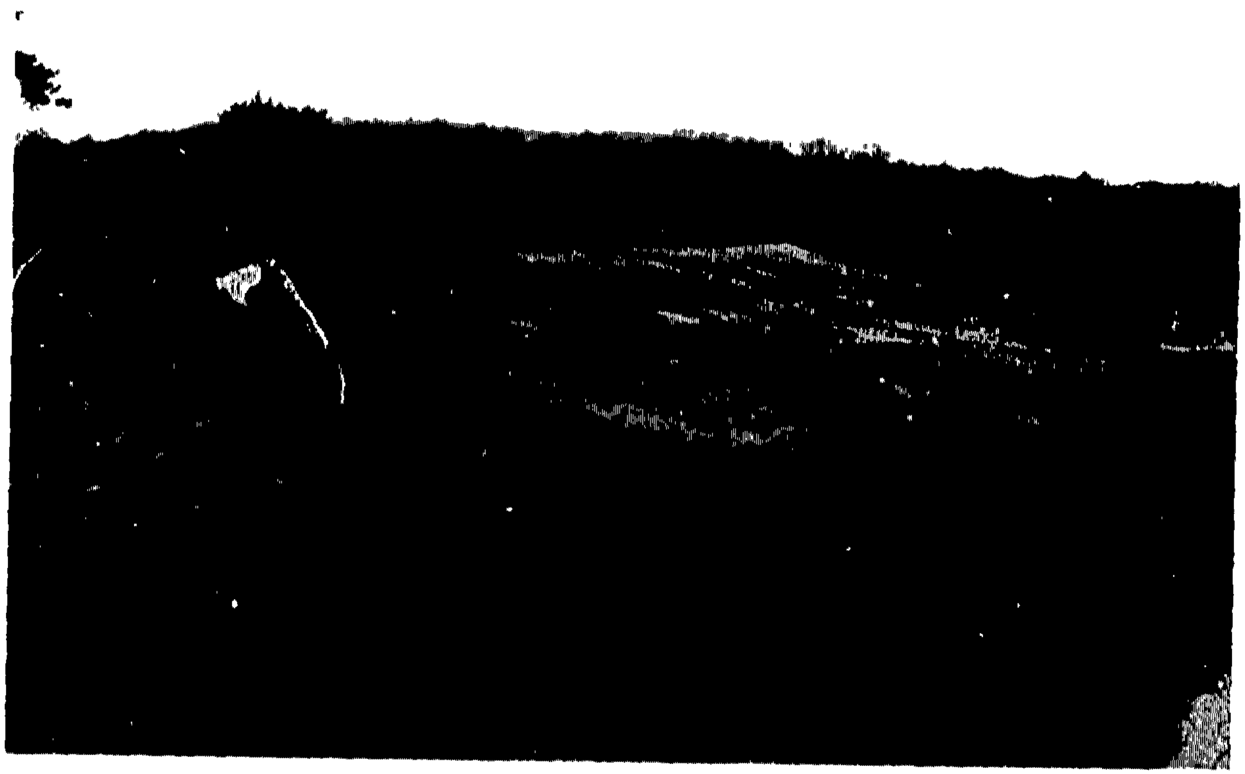


Photo #1
Overview of Fresh Air Fund Dam No. 1

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
FRESH AIR FUND DAM I.D. No. NY 288
SITE 1
DEC #212D-1528 LOWER HUDSON RIVER BASIN
DUTCHESS COUNTY, NEW YORK

SECTION I: PROJECT INFORMATION

1.1 GENERAL

a. Authority
The Phase I Inspection reported herein was authorized by the Department of the Army, New York District, Corps of Engineers, to fulfill the requirements of the National Dam Inspection Act, Public Law 92-367.

b. Purpose of Inspection
Evaluation of the existing conditions of the subject dam to identify deficiencies and hazardous conditions, determine if they constitute hazards to life and property and recommend remedial measures where necessary.

1.2 DESCRIPTION OF PROJECT

a. Description of Dam and Appurtenances
The Fresh Air Fund Dam consists of a 880 feet long homogenous earth embankment with rip rap protection on the upstream slope. It is about 44 feet in height at its maximum, with a crest width of 20 feet. The structure has an upstream slope of 3 to 1 and a downstream slope of 2 1/2 to 1. A 4' x 4' concrete drop inlet spillway is located on the left end of the embankment. It empties into a 36" diameter corrugated metal pipe running through the embankment and into the original stream channel. A 12" steel reservoir drain pipe is located through the embankment at elevation 698. The right end of the embankment is adjacent to the grass lined emergency spillway which is 80 feet wide.

b. Location
The dam is located in the Lower Hudson Basin on the headwaters of an unnamed tributary to the Fishkill Creek.

The Fresh Air Camp is located on the downstream channel approximately 0.4 miles below the dam.

c. Size
The dam is 35 feet high and impounds approximately 288 acre-feet at normal water elevation. The dam is, therefore, classified as "small" in size (25 to 40 feet in height).

d. Hazard Classification
The dam is classified as high hazard due to its location in relation with the Fresh Air Camp and heavy recreational use of the area.

e. Ownership

The dam is owned by the Fresh Air Fund. Mr. Lawrence Mickloic Assistant Executive Director of Camping, 300 W. 43rd Street New York, New York. (212)586-0231. Superintendent, Mr. William Seitz (914)897-4107.

f. Purpose of Dam

The dam is primarily used for recreation associated with the camp.

g. Design and Construction History

The dam was designed by the U.S.D.A. Soil Conservation Service in 1951. It was constructed the same year, by David Alenander of Poughkeepsie New York under the direction of the SCS construction engineer, Mr. Hank Davis.

h. Normal Operating Procedures

Water releases from the reservoir are passed through the drop inlet spillway. The reservoir drain is believed to be operable.

1.3 PERTINENT DATA

a. Drainage Area (acres)	280.
b. Height of Dam (ft.)	35.
c. Discharge at Dam Site (cfs)	
Spillway at Emergency Spillway El.	198
Total at Top of Dam	1092
Reservoir Drain (@ Normal W.S. El.)	22
d. Elevations (ft., USGS)	
Top of Dam	737.
Spillway Crest	732.
Emergency Spillway Crest	734.
e. Reservoir (acres)	
Surface Area at Spillway Crest	22.3
Surface Area at Top of Dam	30.0
f. Storage (acre feet)	
Spillway Crest	288.
Top of Dam	373.
g. Dam	
Type: Homogeneous earth fill dam.	
Length (ft.)	880.
Upstream Slope	3:1
Downstream Slope	2 1/2:1
Crest Width (ft.)	20.

h. Spillway

(1) Service Type: Reinforced concrete drop inlet, bituminous coated corrugated metal pipe.

Size of Inlet (ft.)	4'x4'
Size of Conduit (ft.)	36" dia., 300 lin. ft.

(2) Auxiliary Type: Single vegetated earth channel

Bottom Width (feet)	80
Side Slopes (V:H)	1:2

i. Reservoir Drain

Type: 12" diameter steel pipe.

SECTION 2: ENGINEERING DATA

2.1 GEOLOGY

The Fresh Air Fund Dam is located in the "New England Uplands" physiographic province of New York State. Maximum relief is in the Hudson Highlands, where elevations range from 800 feet below sea level (bedrock of the Hudson River Valley) to more than 1500 feet. Rocks in the uplands are either metamorphic or igneous, and land forms are closely related to their durability. Strong topographic linearity characterizes the Hudson Highlands; most of the ridges and valleys follow the northeastern southwest strike of the metamorphosed rocks.

The "Geologic Map of New York"(1950) indicates that the bedrock in the vicinity of the dam is Biotite-quartz-plagioclase gneiss with subordinate biotite granitic gneiss, amphibolite, calosilicate rock of the Middle Proterozoic Era deformed by the Grenville Orogeny.

The "Preliminary Brittle Structures Map of New York", developed by Isachsen and McKendree (1977), indicates the presence of faults which have experienced, at different times, both dip-slip and strike-slip movement, running in a northeast-southwest direction. These faults occur approximately 1 mile on both the east and west sides of the dam.

2.2 SUBSURFACE INVESTIGATION

A subsurface investigation was conducted by Mr. Louis Berger, Soils Consultant of the Soil Conservation Service, in 1950. This program included a series of auger borings in the borrow and foundation area, and 5 test pits excavated to a depth of 8 feet or bedrock. The program also included laboratory testing, seepage analysis, and embankment stability. This information has been included in Appendix E "Stability Analysis."

The subsurface investigation indicates the following: The left abutment consists of a massive granitic rock outcrop covered in spots by a thin mantleof boulder clay. The valley and right abutment consist of a compact deposit of glacial boulder clay. The soils analysis indicates a high shear strength and a low permeability.

2.3 EMBANKMENT AND APPURTENANT STRUCTURES

The dam was designed and constructed under the supervisor of the Soil Conservation Service. Selected drawings of the dam and appurtenances are included in Appendix F. The dam is composed of homogeneous earth fill, the maximum height of which is 44 feet, an 8 feet wide cutoff trench having side slopes of 1 on 1, and a foundation drain parallel to the axis of the dam, approximately 70 feet downstream from the centerline. A reinforced concrete riser and 36 inch diameter bituminous coated, asphalt paved, corrugated metal pipe serve as the principal spillway. A vegetated earth channel at the right abutment serves as an auxiliary spillway.

2.4 CONSTRUCTION RECORDS

Construction records and specifications are on file at the Camp Operations Center. No major construction changes were reported. The dam was built in 1951 by David Alexander of Poughkeepsie New York. The SCS construction engineer was Mr. Hank Davis.

2.5 OPERATION RECORD

No operation record is available for this structure.

2.6 EVALUATION OF DATA

The data presented in this report has been compiled in part from information obtained from Mr. William Seitz, superintendent of the Fresh Air Fund facility. This information appears adequate and reliable for Phase I Inspection purposes.

SECTION 3: VISUAL INSPECTION

3.1 FINDINGS

a. General

Visual inspection of the Fresh Air Fund Dam No. 1 was conducted on July 9, 1980. The weather was partly cloudy and the temperature ranged in the upper 70's. The water surface was approximating the crest of the service spillway.

b. Embankment

No signs of major distress were observed in connection with the earth embankment. No evidence of misalignment, sloughing, subsidence, depressions, or surface cracking were observed on the embankment slopes or crest. (See Photos #1 & 4) The upstream slope at normal pool level was riprapped. (See Photo #4) Extensive vegetation was observed along the upstream slope, extending to the crest, at the left abutment contact, and at the downstream toe of the embankment. (See Photos #1, 4 & 5) Vegetation was also noted in the vicinity of Service Spillway intake (Photo #2) and on the banks of the auxiliary spillway adjacent to the access bridge. (See Photo #3)

c. Service Spillway

The condition of the service spillway appears to be generally good. Debris was observed at the inlet and in the intake chamber. Extensive vegetation was noted in the outlet channel. The bituminous coating of the outlet pipe is deteriorated, and rust is forming on the exposed corrugated metal pipe. The concrete headwall at the outlet end of the pipe is cracked.

d. Auxiliary Spillway

The auxiliary spillway appears to be in good condition, with the exception of the trees adjacent to the access bridge.

e. Reservoir Drain

The 12 inch diameter reservoir drain, the controls of which are located on the downstream slope near the crest is reported to be operational.

f. Downstream Area

Inspection of the area below the toe of the dam was impeded by the extensive vegetation. Seepage was observed near the left abutment about 40 feet beyond the toe and about 40 feet from the edge of the service road. The amount of seepage was slight, less than 1 gpm, and it appeared clear. (See Photo #6) Below this area, some depressions were observed which appear to be related to the loss of fines through the bouldery surplus fill material spoiled beyond the toe of the dam. (See Photo #7)

g. Reservoir

There are no visible signs of instability or sedimentation problems reported within the reservoir area.

3.2 EVALUATION

The problem areas observed during the inspection and the recommended remedial actions are as follows:

1. Seepage was observed near the left abutment beyond the toe of the dam. Provide a program to bi-weekly monitor the observed seepage.

2. The bituminous coating of the service spillwaypipe is deteriorated and rust is forming on the exposed surfaces of the corrugated metal pipe. Remove the rust as encountered and restore the bituminous coating. Also repair the cracked headwall at the outlet of this pipe.

3. Debris was observed at the inlet of the service spillway and within the intake chamber. Remove this debris. Provide a program of periodic inspection and cleaning.

4. Vegetation was observed on the upstream slope, crest, left abutment, service spillway intake, auxiliary spillway, at the toe of the dam, and in the outlet channel of the service spillway. Remove this vegetation. Provide a program of periodic cutting and mowing of these surfaces.

5. Depressions were noted beyond the downstream toe of the embankment. Backfill these depressions and monitor this area.

6. Provide a program of periodic inspection and maintenance of the dam and appurtenances, including yearly operation and lubrication of the reservoir drain system. Document this information for future reference. Also develop an emergency action plan.

SECTION 4: OPERATION AND MAINTENANCE PROCFDURES

4.1 PROCEDURES

The normal water surface is approximated by the crest of the service spillway. Downstream flows are limited by the 36 inch diameter service spillway pipe, except during extremely heavy run-off when the auxiliary spillway is in service.

4.2 MAINTENANCE OF THE DAM

The dam is maintained by the Fresh Air Fund. Maintenance of the dam is considered inadequate as evidenced by the deterioration of the bituminous coating of the service spillway pipe, debris in the service spillway, vegetation on the dam and the downstream area.

4.3 WARNING SYSTEM

There is no warning system in effect or in preparation.

4.4 EVALUATION

The dam and appurtenances have not been maintained in satisfactory condition as noted in "Section 3: Visual Inspection."

SECTION 5: HYDRAULIC/HYDROLOGIC

5.1 DRAINAGE AREA CHARACTERISTICS

The Fresh Air Fund Dam is located on an intermitant tributary of the Fishkill Creek. The drainage area commanded by the dam is 0.44 square miles. The topography is steep and heavily wooded, thereby resulting in a moderate to high runoff potential.

5.2 ANALYSIS CRITERIA

The analysis of the spillway capacity of the dam and storage of the reservoir was performed using the Corps of Engineers HEC-1 computer model. The unit hydrograph was defined by the Snyder Synthetic Unit Hydrograph method, and the Modified Puls routing procedure was incorporated. The Probable Maximum Precipitation (PMP) was 21.0 inches (24 hr., 200 sq. mi.) from Hydrometeorological Report #33. Several floods were selected (%'s PMF) for analysis in accordance with recommended guidelines of the Corps of Engineers. The PMF inflow of 1341 cfs was routed through the reservoir and the peak outflow was determined to be 1294 cfs.

5.3 SPILLWAY CAPACITY

The service spillway consists of a 4 feet by 4 feet drop inlet with crest elevation 5 feet below top of dam. The capacities at emergency spillway crest and top of dam are 100 cfs and 180 cfs respectively. The emergency spillway is a grass lined channel, 80 foot bottom width, located at the right abutment. The capacity of the emergency spillway at top of dam is 960 cfs.

5.4 RESERVOIR CAPACITY

The reservoir capacities at the crest of the spillway, and at the top of dam are 288.0 and 373.0 acre-feet respectively. Surcharge storage, spillway crest to top of dam, is 85.0 acre feet or an equivalent runoff depth of 3.62 inches.

5.5 FLOODS OF RECORD

It was reported that approximately 1 foot flow depth in the emergency spillway occured in August of 1955. This flow was estimated to be 340 cfs.

5.6 Overtopping Potential

The maximum capacity of the spillways is 1084. cfs before overtopping of the dam would occur. This results in the ability to pass 85% of the PMF; the dam would be overtopped by 0.14 feet during the full PMF. The routed outflows of 1/2 PMF and PMF are 594 cfs and 1294 cfs, respectively.

5.7 Evaluation

The spillway is inadequate to pass the routed PMF outflow of 1294 cfs without overtopping, however, the spillway will pass the 1/2 PMF outflow of 594 cfs with approximately 1.3 feet of freeboard. The spillway is inadequate for all storms in excess of 85% of the PMF.

SECTION 6: STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

a. Visual Observations

No signs of distress were observed in connection with the earth embankment. Seepage was observed near the left abutment beyond the toe of the dam and estimated to be less than 1 gpm.

b. Design and Construction Data

A stability analysis was conducted by SCS during the design of the dam. The analyses were performed using the circular arc method and the following assumed parameters H=50, =135 #/ft^3, C=325 #/S.F. tg ϕ =.29. The results of the stability analyses are as follows.

Condition	Minimum Factor of Safety Upstream Slope	Downstream Slope
During Construction	1.51	1.38
Reservoir Full	1.88	---
Sudden Drawdown	1.005	----

The calculated factors of safety are in excess of the minimum factors recommended by the Corps of Engineers, with the exception of the rapid drawdown case.

Since the values choosen for the determination of shear strength are conservative, and sudden drawdown in this manner unlikely, it is believed that a safety factor of 1.0 is adequate for this case. Therefore, no further analysis is required.

Further information concerning this analysis is included in Appendix E.

c. Post Construction Changes

No post construction changes have been undertaken.

d. Seismic Stability

The dam is located in Seismic Zone 1. Therefore, a seismic analysis is not warranted.

SECTION 7: ASSESSMENT/RECOMMENDATIONS

7.1 ASSESSMENT

a. Safety
The Phase I Inspection of the Fresh Air Fund Dam No. 1 did not reveal conditions which constitute a hazard to human life or property. The earth embankment is not considered to be unstable and appears capable of safely discharging 85% of the PMF.

b. Adequacy of Information
The information reviewed is considered adequate for Phase I Inspection purposes.

c. Need for Additional Investigations
No additional investigations are required at this time.

d. Urgency
The remedial measures listed below must be completed within 1 year of notification to the owner.

7.2 RECOMMENDED MEASURES

1. Monitor at bi-weekly intervals, with the aid of weirs or other measuring devices, the seepage observed near the left abutment beyond the toe of the dam.

2. Repair the deteriorated bituminous coating of the service spillway pipe after removing the observed rust. Also repair the cracked concrete leadwall at the outlet of this pipe.

3. Remove the debris on and within the service spillway intake chamber.

4. Remove the vegetation noted on the upstream slope, crest, left abutment, service spillway intake, auxiliary spillway, along the toe of the dam, and in the outlet channel of the service spillway. Provide a program of periodic cutting and mowing of these surfaces.

5. Backfill the depressions observed beyond the downstream toe of the embankment and monitor the area for the development of additional depressions.

6. Provide a program of periodic inspection and maintenance of the dam and appurtenances, including yearly operation and lubrication of the reservoir drain system. Document this information for future reference. Also, develop an emergency action plan.

APPENDIX A

PHOTOGRAPHS

Photo #2
Service Spillway Intake

Photo #3
Auxiliary Spillway

Photo #4
Upstream Face of Embankment

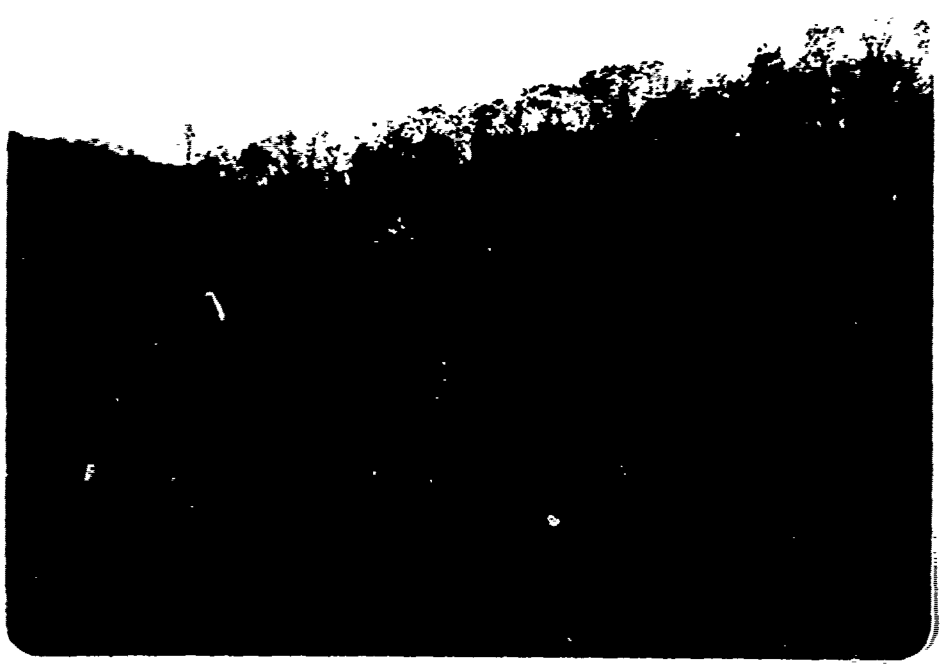


Photo #5
Left Abutment - Downstream Face

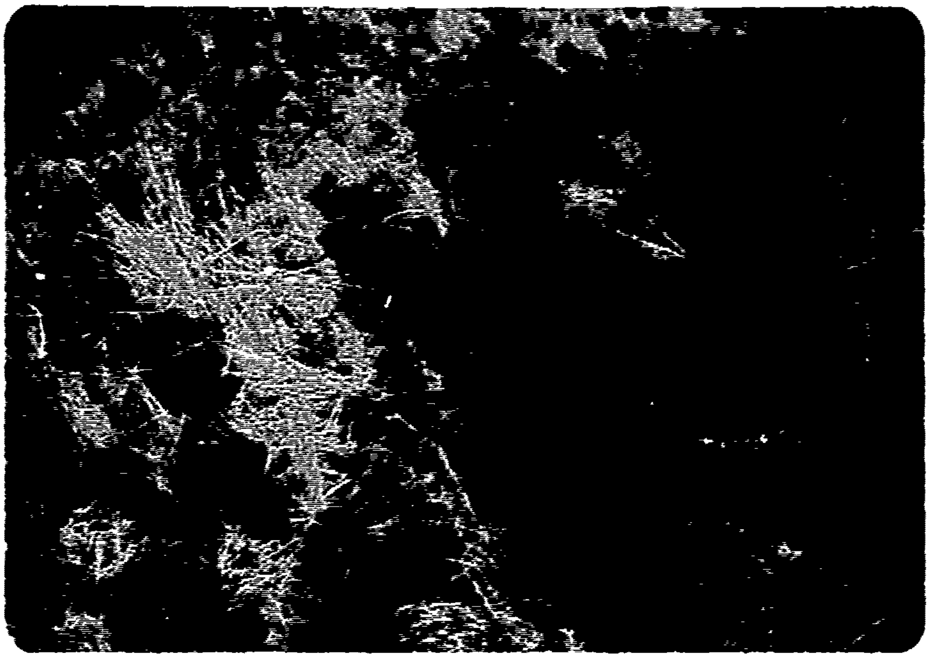


Photo #6
Soft Area Beyond Toe

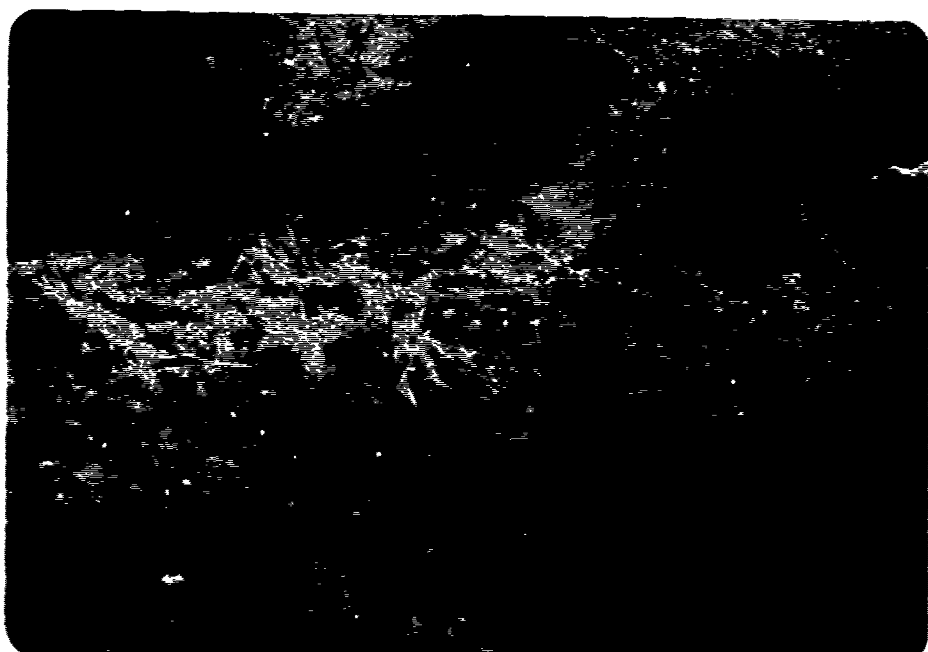


Photo #7
Voids in Downstream Area

APPENDIX B

VISUAL INSPECTION CHECKLIST

VISUAL INSPECTION CHECKLIST

1) Basic Data

a. General

Name of Dam Fresh Air Fund Dam #1 (Deer Lake)

Fed. I.D. # NY 288 DEC Dam No. 212D-1528

River Basin Lower Hudson

Location: Town Fishkill County Dutchess

Stream Name Unnamed tributary of Fishkill Creek

Tributary of Hudson River

Latitude (N) 41° 30.5' Longitude (W) 73° 51.5'

Type of Dam Homogeneous Earth

Hazard Category "C" High

Date(s) of Inspection July 9, 1980

Weather Conditions Partly Cloudy ; Temp 70's

Reservoir Level at Time of Inspection Approximately spillway crest

b. Inspection Personnel Jamie C Veitch Robert P. McCook

c. Persons Contacted (Including Address & Phone No.)

Mr. William Smith Superintendent of Fresh Air Fund Facility

(914) 897-4167

Mr. Lawrence Mickolic Ass't Executive Director, Camping

300 W. 43rd St. N.Y., N.Y. (212) 586-0231

d. History:

Date Constructed 1951 Date(s) Reconstructed n/a

Designer [illegible]

Constructed By [illegible]

Owner Fresh Air Fund 300 W. 43rd St. N.Y. N.Y.

[illegible]

2) Embankment

a. Characteristics

(1) Embankment Material Glacial till

(2) Cutoff Type earth

(3) Impervious Core none

(4) Internal Drainage System 6" diam corrugated metal pipe downstream & parallel to axis

(5) Miscellaneous

b. Crest

(1) Vertical Alignment good

(2) Horizontal Alignment good

(3) Surface Cracks none

(4) Miscellaneous

c. Upstream Slope

(1) Slope (Estimate) (V:H) 1:3

(2) Undesirable Growth or Debris, Animal Burrows extensive vegetation above water line

(3) Sloughing, Subsidence or Depressions none noted

(4) Slope Protection riprap in vicinity of water line

(5) Surface Cracks or Movement at Toe unknown

d. Downstream Slope

(1) Slope (Estimate - V:H) 1:2.5

(2) Undesirable Growth or Debris, Animal Burrows extensive vegetation at left abutment & beyond toe

(3) Sloughing, Subsidence or Depressions none evident

(4) Surface Cracks or Movement at Toe none evident

(5) Seepage none evident

(6) External Drainage System (Ditches, Trenches; Blanket) none

(7) Condition Around Outlet Structure heavy vegetation

(8) Seepage Beyond Toe [illegible]

e. Abutments - Embankment Contact

[illegible]

(1) Erosion at Contact none

(2) Seepage Along Contact none noted

3) Drainage System

a. Description of System 6" diam CMP ~ 70' downstream & parallel to axis of dam w/ filter material surround

b. Condition of System good

c. Discharge from Drainage System little flow

4) Instrumentation (Momumentation/Surveys, Observation Wells, Weirs, Piezometers, Etc.)

none

5) Reservoir

a. Slopes good condition

b. Sedimentation no [illegible]

c. Unusual Conditions Which Affect Dam

6) Area Downstream of Dam

a. Downstream Hazard (No. of Homes, Highways, etc.)

Fresh Air Fund Camp' Maintenance Shops etc

b. Seepage, Unusual Growth [illegible]

[illegible]

c. Evidence of Movement Beyond Toe of Dam none [illegible]

[illegible]

d. Condition of Downstream Channel [illegible]

7) Spillway(s) (Including Discharge Conveyance Channel)

a. General [illegible]

[illegible]

b. Condition of Service Spillway [illegible]

[illegible]

c. Condition of Auxiliary Spillway good condition

was probably in Hurricane Diane - 1955

= 18" flow

some [illegible] [illegible] [illegible] [illegible]

d. Condition of Discharge Conveyance Channel

vegetated

8) Reservoir Drain/Outlet

Type: Pipe ✓ Conduit ______ Other ______

Material: Concrete ______ Metal ✓ Other ______

Size: 12" Length 195

Invert Elevations: Entrance 455 Exit 439

Physical Condition (Describe): Unobservable ______

Material: CMP

Joints: unknown Alignment unknown

Structural Integrity: unknown

Hydraulic Capability:

Means of Control: Gate ______ Valve ✓ Uncontrolled ______

Operation: Operable ✓ Inoperable ______ Other ______

Present Condition (Describe): [illegible]

9) Structural

a. Concrete Surfaces generally good

minor cracking of service spillway

cold joint [illegible]

b. Structural Cracking see above

c. Movement - Horizontal & Vertical Alignment (Settlement)

none noted

d. Junctions with Abutments or Embankments

N/A

e. Drains - Foundation, Joint, Face

good condition of outlet of

[illegible]

f. Water Passages, Conduits, Sluices

rust & deterioration of the outlet

in service spillway pipe

g. Seepage or Leakage [illegible]

h. Joints - Construction, etc.

N/A

i. Foundation [illegible]

j. Abutments N/A

k. Control Gates [illegible]

l. Approach & Outlet Channels [illegible]

m. Energy Dissipators (Plunge Pool, etc.)

[illegible]

[illegible]

n. Intake Structures [illegible]

o. Stabiliry [illegible]

p. Miscellaneous

APPENDIX C

HYDROLOGIC / HYDRAULIC

ENGINEERING DATA AND COMPUTATIONS

CHECK LIST FOR DAMS
HYDROLOGIC AND HYDRAULIC
ENGINEERING DATA

AREA-CAPACITY DATA:

	Elevation (ft.)	Surface Area (acres)	Storage Capacity (acre-ft.)
1) Top of Dam	737.0	30.0	373.0
2) Design High Water (Max. Design Pool)	734.3	≈ 25.0	327.0
3) Auxiliary Spillway Crest	734.0	≈ 24.0	322.0
4) Pool Level with Flashboards	—	—	—
5) Service Spillway Crest	732.0	22.3	288.0

DISCHARGES

	Volume (cfs)
1) Average Daily	0.5
2) Spillway @ Maximum High Water (T of Dam)	180.
3) Service Spillway @ Design High Water	140.
4) Spillway @ Auxiliary Spillway Crest Elevation	100.
5) Low Level Outlet	22.
6) Total (of all facilities) @ Maximum High Water (T of Dam)	1100.
7) Maximum Known Flood	—
8) At Time of Inspection	0.5

DAM CREST: ELEVATION: 734

Type: homogeneous earth fill

Width: 20' crest 3:1 u/s 2½:1 d/s Length: 880'

Spillover none

Location

SPILLWAY:

SERVICE		AUXILIARY
732.0	Elevation	734.0
DROP INLET	Type	GRASSED CHANNEL
4' x 4'	Width	30.0'
	Type of Control	
✓	Uncontrolled	✓
	Controlled:	
	Type (Flashboards; gate)	
	Number	
	Size/Length	
	Invert Material	
	Anticipated Length of operating service	
90' - 36" CMP	Chute Length	
OPEN WEIR	Height Between Spillway Crest & Approach Channel Invert (Weir Flow)	3:1 APPR

HYDROMETEROLOGICAL GAGES:

Type : NONE

Location: —

Records:

Date - Aug. 1955

Max. Reading - Reported 1' in aux. Spillway - max. 340 cfs.

FLOOD WATER CONTROL SYSTEM:

Warning System: NONE

Method of Controlled Releases (mechanisms):

NONE

DRAINAGE AREA: 0.44 Mi.^{2}

DRAINAGE BASIN RUNOFF CHARACTERISTICS:

Land Use - Type: Camp, heavily WOODED

Terrain - Relief: Moderate to steep, intermittent feeders

Surface - Soil: Some clay - low perm.

Runoff Potential (existing or planned extensive alterations to existing (surface or subsurface conditions)

clay with heavy cover on relatively steep slope combine to moderate + high runoff off potential

Potential Sedimentation problem areas (natural or man-made; present or future)

NONE

Potential Backwater problem areas for levels at maximum storage capacity including surcharge storage:

some low lying camps may get wet: not a problem

Dikes - Floodwalls (overflow & non-overflow) - Low reaches along the Reservoir perimeter:

Location: NONE

Elevation:

Reservoir:

Length @ Maximum Pool 1300 ft. ~~(Miles)~~

Length of Shoreline (@ Spillway Crest) 1/2 Mi. ~~(Miles)~~

HEFARD TERRACE POND #1

DRAINAGE AREA: 230 ACRES = 0.44 mi² (No Records)

BASIN : TOTALLY WOODED.

S = ... = 0.19 (fairly steep but fairly ...)

L = 3400' = .64 mi L_{CA} = 1000' = 0.19 mi

C_t = 2.0 $t_p = C_t (L \cdot L_{CA})^{.3}$ = 1.06 hr.

C_p = 0.625 t_r = 0.2 hrs   say .25 hr

$T_p = t_p + .5 t_r$ = 1.06 hr + .125 hr = 1.2 hr.

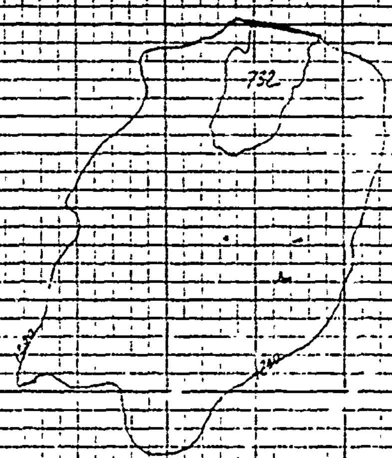
Storage Capacity / Flexible Capacity
Peak (SCS)   450.0 spillway = 732 USGS   Top of 732   ... 73?

EL.	Q.	EL.	STORAGE AC-FT
732	—	702	0
733	35	712	28
...	...	732	283
...	...	736	356

Σ PMP = 21.0"   % 111 (6 hr) 123 (12) 133 (24) 142 (48)

L_{DAM} = 830'   TOD = 1.85 737 USGS.
Spillway: 732

DRAIN @ ...
$Q = .6 \sqrt{2g} (.7) 30$
= 22 cfs



HERALD TRIBUNE FRESH AIR
#1

DRAINAGE AREA
& POND AREA CHECK

DA = 3.04 □
= 279.2 ACRES
SAY 280 ACRES or 0.44 mi.²

POND AREA = 0.29 □
= 27 ACRES.

```
*******************************                                        ********************************
FLOOD HYDROGRAPH PACKAGE (HEC-1)                                       NEW YORK STATE
DAM SAFETY VERSION      JULY 1978                                      DEPT OF ENVIRONMENTAL CONSERVATION
  LAST MODIFICATION  25 FEB 79                                         FLOOD PROTECTION BUREAU
  MODIFIED FOR HONEYWELL APR 79
*******************************                                        ********************************
 A     [redacted] FRESH AIR FUND  #1
 A     PMF ANALYSIS
 A     26 JUNE 1980
 B     150
 B1      5       0      15       0       0       0       0       0       0       0
 J       1       6       1
 J1     .2      .4      .5      .6      .8       1
 K       0       1                                       1
 K1    HYDROGRAPH
 M       1       1    0.44            0.44                               1
 P            21.0     111     123     133     142
 T                                                     1.0     0.1
 W    1.20    .625
 X      -2       2       1
 K       1       1                                       1
 K1    ROUTE RUNOFF THROUGH RESERVOIR
 Y                               1       1
 Y1      1                                          -732.0      -1
 Y4    732     733     734   734.6     735     736
 Y5             38      97     198     312     702
 $S             28     288     356
 $E    702     712     732     736
 $$    732
 $D    737       3     1.5     880
 K      99
 A
 A
 A
 A
 A
```

```
PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS
        RUNOFF HYDROGRAPH AT            1
        ROUTE HYDROGRAPH TO             1
        END OF NETWORK
```

```
******************************                                    ******************************
FLOOD HYDROGRAPH PACKAGE (HEC-1)                                  NEW YORK STATE
DAM SAFETY VERSION      JULY 1978                                 DEPT OF ENVIRONMENTAL CONSERVATION
  LAST MODIFICATION  26 FEB 79                                    FLOOD PROTECTION BUREAU
  MODIFIED FOR HONEYWELL APR 79
******************************                                    ******************************

RUN  DATE 06/26/80
                 HERALD TRIBUNE FRESH AIR FUND  #1
                 PMF ANALYSIS
                 26 JUNE 1980

                                     JOB SPECIFICATION
        NQ     NHR    NMIN    IDAY    IHR    IMIN   METRC    IPLT    IPRT   NSTAN
       150       0      15       0      0       0       0       0       0       0
                              JOPER    NWT   LROPT   TRACE
                                  5      0       0       0

                         MULTI-PLAN ANALYSES TO BE PERFORMED
                              NPLAN= 1 NRTIO= 6 LRTIO= 1
         RTIOS=   0.20   0.40   0.50   0.60   0.80   1.00

     **********        **********        **********        **********        **********

                              SUB-AREA RUNOFF COMPUTATION

         HYDROGRAPH
                 ISTAQ   ICOMP   IECON   ITAPE    JPLT    JPRT   INAME  ISTAGE   IAUTO
                     1       0       0       0       0       0       1       0       0

                                   HYDROGRAPH DATA
         IHYDG    IUHG   TAREA    SNAP   TRSDA   TRSPC   RATIO   ISNOW   ISAME   LOCAL
             1       1    0.44      0.    0.44      0.      0.       0       1       0

                                     PRECIP DATA
                SPFE     PMS      R6     R12     R24     R48     R72     R96
                  0.   21.00  111.00  123.00  133.00  142.00      0.      0.
TRSPC COMPUTED BY THE PROGRAM IS 0.800

                                      LOSS DATA
       LROPT   STRKR   DLTKR   RTIOL   ERAIN   STRKS   RTIOK   STRTL   CNSTL   ALSMX   RTIMP
           0      0.      0.    1.00      0.      0.    1.00    1.00    0.10      0.      0.

                                 UNIT HYDROGRAPH DATA
                           TP=  1.20     CP=0.63     NTA=  0

                                    RECESSION DATA
                         STRTQ=   -2.00    QRCSN=    2.00    RTIOR= 1.00
APPROXIMATE CLARK COEFFICIENTS FROM GIVEN SNYDER CP AND TP ARE TC= 5.49 AND R= 4.37 INTERVALS

          UNIT HYDROGRAPH 27 END-OF-PERIOD ORDINATES, LAG=   1.20 HOURS, CP= 0.63   VOL= 1.00
        13.       46.       90.      129.      148.      141.      117.       93.       74.       58.
        46.       37.       29.       23.       19.       15.       12.        9.        7.        6.
         5.        4.        3.        2.        2.        1.        1.

       0                                END-OF-PERIOD FLOW
   MO.DA  HR.MN  PERIOD   RAIN   EXCS   LOSS    COMP Q      MO.DA  HR.MN  PERIOD   RAIN   EXCS   LOSS    COMP Q
                      1   0.00     0.   0.00        1.       1.02   0.15      97   0.03   0.00   0.03        2.
                                                             1.02   0.30      98   0.03   0.00   0.03        2.
```

1.01	1.00	4	0.00	0.	0.00	1.	1.02	1.00	100	0.03	0.00	0.03	2.
1.01	1.15	5	0.00	0.	0.00	1.	1.02	1.15	101	0.03	0.00	0.03	2.
1.01	1.30	6	0.00	0.	0.00	1.	1.02	1.30	102	0.03	0.00	0.03	3.
1.01	1.45	7	0.00	0.	0.00	1.	1.02	1.45	103	0.03	0.00	0.03	3.
1.01	2.00	8	0.00	0.	0.00	1.	1.02	2.00	104	0.03	0.00	0.03	3.
1.01	2.15	9	0.00	0.	0.00	1.	1.02	2.15	105	0.03	0.00	0.03	3.
1.01	2.30	10	0.00	0.	0.00	1.	1.02	2.30	106	0.03	0.00	0.03	4.
1.01	2.45	11	0.00	0.	0.00	1.	1.02	2.45	107	0.03	0.00	0.03	4.
1.01	3.00	12	0.00	0.	0.00	1.	1.02	3.00	108	0.03	0.00	0.03	4.
1.01	3.15	13	0.00	0.	0.00	1.	1.02	3.15	109	0.03	0.00	0.03	4.
1.01	3.30	14	0.00	0.	0.00	1.	1.02	3.30	110	0.03	0.00	0.03	4.
1.01	3.45	15	0.00	0.	0.00	1.	1.02	3.45	111	0.03	0.00	0.03	4.
1.01	4.00	16	0.00	0.	0.00	1.	1.02	4.00	112	0.03	0.00	0.03	4.
1.01	4.15	17	0.00	0.	0.00	1.	1.02	4.15	113	0.03	0.00	0.03	4.
1.01	4.30	18	0.00	0.	0.00	1.	1.02	4.30	114	0.03	0.00	0.03	4.
1.01	4.45	19	0.00	0.	0.00	1.	1.02	4.45	115	0.03	0.00	0.03	4.
1.01	5.00	20	0.00	0.	0.00	1.	1.02	5.00	116	0.03	0.00	0.03	4.
1.01	5.15	21	0.00	0.	0.00	1.	1.02	5.15	117	0.03	0.00	0.03	4.
1.01	5.30	22	0.00	0.	0.00	1.	1.02	5.30	118	0.03	0.00	0.03	4.
1.01	5.45	23	0.00	0.	0.00	1.	1.02	5.45	119	0.03	0.00	0.03	4.
1.01	6.00	24	0.00	0.	0.00	1.	1.02	6.00	120	0.03	0.00	0.03	4.
1.01	6.15	25	0.01	0.	0.01	1.	1.02	6.15	121	0.08	0.06	0.03	5.
1.01	6.30	26	0.01	0.	0.01	1.	1.02	6.30	122	0.08	0.06	0.03	8.
1.01	6.45	27	0.01	0.	0.01	1.	1.02	6.45	123	0.08	0.06	0.03	13.
1.01	7.00	28	0.01	0.	0.01	1.	1.02	7.00	124	0.08	0.06	0.03	20.
1.01	7.15	29	0.01	0.	0.01	1.	1.02	7.15	125	0.08	0.06	0.03	28.
1.01	7.30	30	0.01	0.	0.01	1.	1.02	7.30	126	0.08	0.06	0.03	36.
1.01	7.45	31	0.01	0.	0.01	1.	1.02	7.45	127	0.08	0.06	0.03	43.
1.01	8.00	32	0.01	0.	0.01	1.	1.02	.00	128	0.08	0.06	0.03	48.
1.01	8.15	33	0.01	0.	0.01	1.	1.02	8.15	129	0.08	0.06	0.03	52.
1.01	8.30	34	0.01	0.	0.01	1.	1.02	8.30	130	0.08	0.06	0.03	55.
1.01	8.45	35	0.01	0.	0.01	1.	1.02	8.45	131	0.08	0.06	0.03	58.
1.01	9.00	36	0.01	0.	0.01	1.	1.02	9.00	132	0.08	0.06	0.03	60.
1.01	9.15	37	0.01	0.	0.01	1.	1.02	9.15	133	0.08	0.06	0.03	61.
1.01	9.30	38	0.01	0.	0.01	1.	1.02	9.30	134	0.08	0.06	0.03	63.
1.01	9.45	39	0.01	0.	0.01	1.	1.02	9.45	135	0.08	0.06	0.03	64.
1.01	10.00	40	0.01	0.	0.01	1.	1.02	10.00	136	0.08	0.06	0.03	65.
1.01	10.15	41	0.01	0.	0.01	1.	1.02	10.15	137	0.08	0.06	0.03	65.
1.01	10.30	42	0.01	0.	0.01	1.	1.02	10.30	138	0.08	0.06	0.03	66.
1.01	10.45	43	0.01	0.	0.01	1.	1.02	10.45	139	0.08	0.06	0.03	66.
1.01	11.00	44	0.01	0.	0.01	1.	1.02	11.00	140	0.08	0.06	0.03	67.
1.01	11.15	45	0.01	0.	0.01	1.	1.02	11.15	141	0.08	0.06	0.03	67.
1.01	11.30	46	0.01	0.	0.01	1.	1.02	11.30	142	0.08	0.06	0.03	67.
1.01	11.45	47	0.01	0.	0.01	1.	1.02	11.45	143	0.08	0.06	0.03	67.
1.01	12.00	48	0.01	0.	0.01	1.	1.02	12.00	144	0.08	0.06	0.03	67.
1.01	12.15	49	0.03	0.	0.03	1.	1.02	12.15	145	0.47	0.44	0.02	72.
1.01	12.30	50	0.03	0.	0.03	1.	1.02	12.30	146	0.47	0.44	0.02	90.
1.01	12.45	51	0.03	0.	0.03	1.	1.02	12.45	147	0.47	0.44	0.02	125.
1.01	13.00	52	0.03	0.	0.03	1.	1.02	13.00	148	0.47	0.44	0.02	174.
1.01	13.15	53	0.04	0.	0.04	1.	1.02	13.15	149	0.56	0.53	0.02	232.
1.01	13.30	54	0.04	0.	0.04	1.	1.02	13.30	150	0.56	0.53	0.02	290.
1.01	13.45	55	0.04	0.	0.04	1.	0.	0.	151	0.56	0.53	0.02	343.
1.01	14.00	56	0.04	0.	0.04	1.	0.	0.	152	0.56	0.53	0.02	391.
1.01	14.15	57	0.05	0.	0.05	1.	0.	0.	153	0.70	0.67	0.02	434.
1.01	14.30	58	0.05	0.	0.05	1.	0.	0.	154	0.70	0.67	0.02	476.
1.01	14.45	59	0.05	0.	0.05	1.	0.	0.	155	0.70	0.67	0.02	518.
1.01	15.00	60	0.05	0.	0.05	1.	0.	0.	156	0.70	0.67	0.02	558.
1.01	15.15	61	0.05	0.	0.05	1.	0.	0.	157	0.71	0.68	0.02	597.
1.01	15.30	62	0.10	0.	0.10	1.	0.	0.	158	1.42	1.39	0.03	641.
1.01	15.45	63	0.27	0.06	0.21	2.	0.	0.	159	3.97	3.94	0.03	735.
1.01	16.00	64	0.07	0.04	0.03	4.	0.	0.	160	0.99	0.97	0.02	903.
1.01	16.15	65	0.04	0.02	0.03	8.	0.	0.	161	0.65	0.63	0.02	1101.
1.01	16.30	66	0.04	0.02	0.03	13.	0.	0.	162	0.65	0.63	0.02	1265.
1.01	16.45	67	0.04	0.02	0.03	17.	0.	0.	163	0.65	0.63	0.02	1341.
1.01	17.00	68	0.04	0.02	0.03	20.	0.	0.	164	0.65	0.63	0.02	1309.

1.01	17.30	70	0.03	0.01	0.03	21.	0.	0.	166	0.51	0.49	0.02	1100.
1.01	17.45	71	0.03	0.01	0.03	21.	0.	0.	167	0.51	0.49	0.02	1006.
1.01	18.00	72	0.03	0.01	0.03	19.	0.	0.	168	0.51	0.49	0.02	924.
1.01	18.15	73	0.00	0.	0.00	18.	0.	0.	169	0.04	0.02	0.03	846.
1.01	18.30	74	0.00	0.	0.00	16.	0.	0.	170	0.04	0.02	0.03	763.
1.01	18.45	75	0.00	0.	0.00	14.	0.	0.	171	0.04	0.02	0.03	672.
1.01	19.00	76	0.00	0.	0.00	12.	0.	0.	172	0.04	0.02	0.03	573.
1.01	19.15	77	0.00	0.	0.00	10.	0.	0.	173	0.04	0.02	0.03	472.
1.01	19.30	78	0.00	0.	0.00	8.	0.	0.	174	0.04	0.02	0.03	381.
1.01	19.45	79	0.00	0.	0.00	7.	0.	0.	175	0.04	0.02	0.03	306.
1.01	20.00	80	0.00	0.	0.00	6.	0.	0.	176	0.04	0.02	0.03	247.
1.01	20.15	81	0.00	0.	0.00	5.	0.	0.	177	0.04	0.02	0.03	200.
1.01	20.30	82	0.00	0.	0.00	4.	0.	0.	178	0.04	0.02	0.03	162.
1.01	20.45	83	0.00	0.	0.00	3.	0.	0.	179	0.04	0.02	0.03	133.
1.01	21.00	84	0.00	0.	0.00	3.	0.	0.	180	0.04	0.02	0.03	109.
1.01	21.15	85	0.00	0.	0.00	2.	0.	0.	181	0.04	0.02	0.03	90.
1.01	21.30	86	0.00	0.	0.00	2.	0.	0.	182	0.04	0.02	0.03	75.
1.01	21.45	87	0.00	0.	0.00	2.	0.	0.	183	0.04	0.02	0.03	63.
1.01	22.00	88	0.00	0.	0.00	2.	0.	0.	184	0.04	0.02	0.03	54.
1.01	22.15	89	0.00	0.	0.00	2.	0.	0.	185	0.04	0.02	0.03	46.
1.01	22.30	90	0.00	0.	0.00	2.	0.	0.	186	0.04	0.02	0.03	37.
1.01	22.45	91	0.00	0.	0.00	2.	0.	0.	187	0.04	0.02	0.03	32.
1.01	23.00	92	0.00	0.	0.00	2.	0.	0.	188	0.04	0.02	0.03	29.
1.01	23.15	93	0.00	0.	0.00	2.	0.	0.	189	0.04	0.02	0.03	27.
1.01	23.30	94	0.00	0.	0.00	2.	0.	0.	190	0.04	0.02	0.03	25.
1.01	23.45	95	0.00	0.	0.00	2.	0.	0.	191	0.04	0.02	0.03	23.
1.02	0.	96	0.00	0.	0.00	2.	0.	0.	192	0.04	0.02	0.03	22.
									SUM	23.86	20.16	3.70	22850.
										(606.)	(512.)	(94.)	(647.04)

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1341.	772.	234.	119.	22832.
CMS	38.	22.	7.	3.	647.
INCHES		16.33	19.82	20.11	20.11
MM		414.73	503.44	510.86	510.86
AC-FT		383.	465.	472.	472.
THOUS CU M		472.	573.	582.	582.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 1

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	1.	2.	3.	3.	4.	4.	4.
4.	4.	4.	3.	3.	2.	2.	2.	1.	1.
1.	1.	1.	1.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	2.	3.	4.	6.	7.	9.	10.	10.	11.
12.	12.	12.	13.	13.	13.	13.	13.	13.	13.
13.	13.	13.	13.	14.	18.	25.	35.	46.	58.
69.	78.	87.	95.	104.	112.	119.	128.	147.	181.
220.	253.	268.	262.	241.	220.	201.	185.	169.	153.
134.	115.	94.	76.	61.	49.	40.	32.	27.	22.
18.	15.	13.	11.	9.	7.	6.	6.	5.	5.
5.	4.								

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	268.	154.	47.	24.	4566.
CMS	8.	4.	1.	1.	129.

INCHES	[illegible]	[illegible]	[illegible]		[illegible]
MM	82.95	100.69	102.17		102.17
AC-FT	77.	93.	94.		94.
THOUS CU M	94.	115.	116.		116.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 2

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	1.	2.	3.	5.	7.	8.	9.	9.
8.	8.	7.	7.	6.	5.	4.	3.	3.	2.
2.	2.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	2.	2.	2.
2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
3.	3.	5.	8.	11.	14.	17.	19.	21.	22.
23.	24.	25.	25.	26.	26.	26.	26.	26.	27.
27.	27.	27.	27.	29.	36.	50.	70.	93.	116.
137.	156.	174.	191.	207.	223.	239.	256.	294.	361.
440.	506.	537.	523.	483.	440.	403.	369.	338.	305.
269.	229.	189.	152.	122.	99.	80.	65.	53.	44.
36.	30.	25.	21.	18.	15.	13.	12.	11.	10.
9.	9.								

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	537.	309.	94.	48.	9133.
CMS	15.	9.	3.	1.	259.
INCHES		6.53	7.93	8.05	8.05
MM		165 89	201.38	204.34	204.34
AC-FT		153.	186.	189.	189.
THOUS CU M		189.	229.	233.	233.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 3

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	1.	2.	4.	6.	9.	10.	11.	11.
10.	10.	9.	8.	7.	6.	5.	4.	3.	3.
2.	2.	2.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	2.	2.	2.	2.	2.	2.	2.
2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
2.	4.	6.	10.	14.	18.	21.	24.	26.	28.
29.	30.	31.	31.	32.	32.	33.	33.	33.	33.
33.	34.	34.	34.	35.	45.	62.	87.	116.	145.
172.	195.	217.	238.	259.	279.	299.	320.	368.	451.
550.	632.	671.	654.	603.	550.	503.	462.	423.	382.
336.	286.	236.	190.	153.	123.	100.	81.	66.	54.
45.	38.	32.	27.	23.	18.	16.	15.	13.	12.
12.	11.								

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	671.	386.	117.	59.	11416.
CMS	19.	11.	3.	2.	323.
INCHES		8.16	9.91	10.06	10.06
MM		207.36	251.72	255.43	255.43
AC-FT		191.	232.	236.	236.
THOUS CU M		236.	287.	291.	291.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 4

1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	2.	5.	8.	10.	12.	13.	13.
12.	12.	11.	10.	9.	7.	6.	5.	4.	3.
3.	2.	2.	2.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	2.	2.	2.	2.	2.	2.	2.	2.	2.
2.	2.	2.	3.	3.	3.	3.	3.	3.	3.
3.	5.	8.	12.	17.	22.	26.	29.	31.	33.
35.	36.	37.	38.	38.	39.	39.	39.	40.	40.
40.	40.	40.	40.	43.	54.	75.	104.	139.	174.
206.	234.	261.	286.	311.	335.	358.	385.	441.	542.
660.	759.	805.	785.	724.	660.	604.	554.	507.	456.
403.	344.	283.	228.	184.	148.	120.	97.	80.	65.
54.	45.	38.	32.	27.	22.	19.	18.	16.	15.
14.	13.								

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	805.	463.	141.	71.	13659.
CMS	23.	13.	4.	2.	388.
INCHES		9.80	11.89	12.07	12.07
MM		248.84	302.06	306.51	306.51
AC-FT		230.	279.	283.	283.
THOUS CU M		283.	344.	349.	349.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 5

1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	3.	6.	10.	14.	16.	17.	17.
16.	16.	14.	13.	12.	10.	8.	7.	5.	4.
4.	3.	3.	2.	2.	2.	2.	2.	2.	2.
2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
2.	2.	2.	3.	3.	3.	3.	3.	3.	3.
3.	3.	3.	3.	3.	3.	3.	3.	3.	3.
4.	6.	10.	16.	23.	29.	34.	38.	42.	44.
46.	48.	49.	50.	51.	52.	52.	53.	53.	53.
53.	54.	54.	54.	58.	72.	100.	139.	186.	232.
274.	312.	347.	381.	414.	447.	478.	513.	588.	722.
880.	1012.	1073.	1047.	966.	880.	809.	739.	677.	611.
538.	458.	377.	304.	245.	198.	160.	130.	106.	87.
72.	60.	51.	43.	36.	29.	26.	23.	21.	20.
19.	18.								

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1073.	618.	188.	95.	18265.
CMS	30.	17.	5.	3.	517.
INCHES		13.06	15.86	16.09	16.09
MM		331.78	402.75	408.69	408.69
AC-FT		306.	372.	377.	377.
THOUS CU M		378.	459.	465.	465.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 6

1.	1.	1.	1.	1.	1.	1.	1.	1.	1.

1.	1.	1.	1.	1.	1.	1.	1.	1.	
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	2.	4.	8.	13.	17.	20.	21.	21.
21.	19.	10.	16.	14.	12.	10.	8.	7.	6.
5.	4.	3.	3.	2.	2.	2.	2.	2.	2.
2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
2.	3.	3.	3.	3.	4.	4.	4.	4.	4.
4.	4.	4.	4.	4.	4.	4.	4.	4.	4.
5.	8.	13.	20.	28.	36.	43.	48.	52.	55.
58.	60.	61.	63.	64.	65.	65.	66.	66.	67.
67.	67.	67.	67.	72.	90.	125.	174.	232.	290.
343.	391.	434.	476.	518.	558.	597.	641.	735.	503.
1101.	1265.	1341.	1309.	1207.	1100.	1006.	924.	846.	763.
672.	573.	472.	381.	306.	247.	200.	162.	133.	109.
90.	75.	63.	54.	46.	37.	32.	29.	27.	25.
23.	22.								

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1341.	772.	234.	119.	22032.
CMS	38.	22.	7.	3.	647.
INCHES		16.33	19.82	20.11	20.11
MM		414.73	503.44	510.86	510.86
AC-FT		383.	465.	472.	472.
THOUS CU M		472.	573.	582.	582.

********** ********** ********** ********** **********

HYDROGRAPH ROUTING

ROUTE RUNOFF THROUGH RESERVOIR

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
1	1	0	0	0	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.	0.	0.	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.	0.	0.	-732.	-1

STAGE	732.00	733.00	734.00	734.60	735.00	736.00
FLOW	0.	38.00	97.00	198.00	312.00	702.00

CAPACITY=	0.	28.	288.	356.
ELEVATION=	702.	712.	732.	736.

CREL	SPWID	COQW	EXPW	ELEVL	COQL	CAREA	EXPL
732.0	0.	0.	0.	0.	0.	0.	0.

DAM DATA

TOPEL	COQD	EXPD	DAMWID
737.0	3.0	1.5	880.

WARNING *** TOP OF DAM, BOTTOM OF BREACH, OR LOW-LEVEL OUTLET IS NOT WITHIN RANGE OF GIVEN ELEVATIONS IN STORAGE-ELEVATION DATA
BOTTOM OF RESERVOIR ASSUMED TO BE AT 702.00
STORAGE-ELEVATION DATA WILL BE EXTRAPOLATED ABOVE ELEVATION 736.00

STATION 1, PLAN 1, RATIO 1

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	1.	1.	1.
1.	1.	1.	1.	1.	2.	2.	2.	2.	2.
2.	2.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	2.	2.	2.	3.
3.	4.	4.	4.	5.	5.	5.	6.	6.	6.
7.	7.	7.	8.	8.	8.	9.	10.	11.	13.
15.	18.	21.	24.	27.	31.	35.	39.	46.	54.
64.	76.	89.	108.	135.	153.	163.	169.	170.	169.
164.	157.	147.	136.	123.	111.	98.	93.	89.	84.
80.	76.	71.	67.	63.	59.	56.	52.	49.	46.
43.	41.								

STORAGE

288.	288.	289.	288.	288.	288.	288.	288.	288.	288.
288.	288.	288.	288.	288.	288.	288.	288.	288.	288.
288.	288.	288.	288.	288.	288.	288.	288.	288.	288.
288.	288.	288.	288.	288.	288.	288.	288.	288.	288.
288.	288.	288.	288.	288.	288.	288.	288.	288.	288.
288.	288.	288.	288.	288.	288.	288.	288.	288.	288.
288.	288.	288.	288.	288.	288.	288.	288.	288.	288.
288.	289.	289.	289.	289.	289.	289.	289.	289.	289.
289.	289.	289.	289.	289.	289.	289.	289.	289.	289.
289.	289.	288.	288.	288.	288.	288.	288.	288.	288.
288.	288.	288.	288.	288.	288.	288.	288.	288.	288.
288.	288.	288.	288.	288.	288.	288.	288.	288.	288.
288.	288.	288.	288.	289.	289.	289.	289.	289.	289.
289.	290.	290.	290.	290.	290.	290.	291.	291.	291.
291.	291.	291.	291.	292.	292.	292.	292.	293.	294.
295.	296.	297.	299.	300.	302.	304.	305.	307.	310.
313.	316.	320.	323.	326.	328.	329.	329.	329.	329.
329.	328.	327.	326.	325.	323.	322.	321.	320.	318.
317.	316.	315.	313.	312.	311.	310.	309.	308.	307.
305.	306.								

STAGE

732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0
732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0
732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0
732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0
732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0
732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0
732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0
732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0
732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0
732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0
732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0
732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0
732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.1	732.1	732.1
732.1	732.1	732.1	732.1	732.1	732.1	732.1	732.2	732.2	732.2
732.2	732.2	732.2	732.2	732.2	732.2	732.2	732.3	732.3	732.3
732.4	732.5	732.5	732.6	732.7	732.8	732.9	733.0	733.1	733.3
733.4	733.6	733.9	734.1	734.2	734.3	734.4	734.4	734.4	734.4
734.4	734.4	734.3	734.2	734.2	734.1	734.0	733.9	733.9	733.8
733.7	733.6	733.6	733.5	733.4	733.4	733.3	733.2	733.2	733.1
[illegible]	[illegible]								

PEAK OUTFLOW IS 170. AT TIME 42.25 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	170.	116.	38.	19.	3710.
CMS	5.	3.	1.	1.	105.
INCHES		2.46	3.23	3.27	3.27
MM		62.47	82.01	83.01	83.01
AC-FT		58.	76.	77.	77.
THOUS CU M		71.	93.	95.	95.

WARNING *** TOP OF DAM, BOTTOM OF BREACH, OR LOW-LEVEL OUTLET IS NOT WITHIN RANGE OF GIVEN ELEVATIONS IN STORAGE-ELEVATION DATA
BOTTOM OF RESERVOIR ASSUMED TO BE AT 702.00
STORAGE-ELEVATION DATA WILL BE EXTRAPOLATED ABOVE ELEVATION 736.00

STATION 1, PLAN 1, RATIO 2

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	1.	1.	1.	2.	2.
2.	2.	3.	3.	3.	3.	3.	3.	3.	3.
3.	3.	3.	3.	3.	3.	3.	3.	2.	2.
2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
2.	2.	2.	2.	2.	3.	3.	4.	5.	6.
6.	7.	8.	9.	9.	10.	11.	12.	12.	13.
13.	14.	15.	15.	16.	17.	18.	20.	22.	26.
31.	36.	44.	53.	63.	74.	85.	96.	128.	165.
215.	291.	373.	433.	460.	460.	445.	423.	396.	368.
337.	305.	277.	245.	214.	189.	170.	152.	135.	119.
104.	95.	90.	86.	81.	77.	72.	63.	64.	60.
57.	54.								

STORAGE

288.	288.	288.	288.	288.	288.	288.	288.	288.	288.
288.	288.	288.	288.	288.	288.	288.	288.	288.	288.
288.	288.	288.	288.	288.	288.	288.	288.	288.	288.
288.	288.	288.	288.	288.	288.	288.	288.	288.	288.
288.	288.	288.	288.	288.	288.	288.	288.	288.	288.
288.	288.	288.	288.	288.	288.	288.	288.	288.	288.
288.	288.	288.	288.	288.	288.	288.	289.	289.	289.
289.	289.	289.	289.	289.	289.	289.	289.	289.	289.
289.	289.	289.	289.	289.	289.	289.	289.	289.	289.
289.	289.	289.	289.	289.	289.	289.	289.	289.	289.
289.	289.	289.	289.	289.	289.	289.	289.	289.	289.
289.	289.	289.	289.	289.	289.	289.	289.	289.	289.
289.	289.	289.	289.	289.	289.	290.	290.	290.	290.
291.	291.	292.	292.	292.	293.	293.	293.	293.	294.
294.	294.	295.	295.	295.	295.	296.	297.	298.	300.
302.	304.	307.	309.	312.	315.	318.	322.	325.	329.
333.	338.	342.	344.	345.	345.	345.	344.	343.	341.
340.	339.	337.	335.	333.	331.	329.	328.	326.	324.
323.	321.	320.	319.	317.	316.	315.	314.	313.	311.
310.	309.								

STAGE

732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0
732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0
732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0
732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0
732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0
732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0
732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0
732.1	732.1	732.1	732.1	732.1	732.1	732.1	732.1	732.1	732.1
732.1	732.1	732.1	732.1	732.1	732.1	732.1	732.1	732.1	732.1
732.1	732.1	732.1	732.1	732.1	732.1	732.1	732.0	732.0	732.0
732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0
732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0
732.0	732.0	732.0	732.1	732.1	732.1	732.1	732.1	732.1	732.1
732.2	732.2	732.2	732.2	732.2	732.3	732.3	732.3	732.3	732.3
732.4	732.4	732.4	732.4	732.4	732.4	732.5	732.5	732.6	732.7
732.8	732.9	733.1	733.3	733.4	733.6	733.8	734.0	734.2	734.4
734.7	734.9	735.2	735.3	735.4	735.4	735.3	735.3	735.2	735.1
735.1	735.0	734.9	734.8	734.7	734.5	734.4	734.3	734.2	734.1
734.0	734.0	733.9	733.8	733.7	733.7	733.6	733.5	733.4	733.4
733.3	733.3								

PEAK OUTFLOW IS 460. AT TIME 41.50 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	460.	271.	83.	42.	8095.
CMS	13.	8.	2.	1.	229.
INCHES		5.72	7.05	7.13	7.13
MM		145.41	179.11	181.12	181.12
AC-FT		134.	165.	167.	167.
THOUS CU M		166.	204.	206.	206.

WARNING *** TOP OF DAM, BOTTOM OF BREACH, OR LOWEST OUTLET IS NOT WITHIN RANGE OF GIVEN ELEVATIONS IN STORAGE-ELEVATION DATA
BOTTOM OF RESERVOIR ASSUMED TO BE AT 702.00
STORAGE-ELEVATION DATA WILL BE EXTRAPOLATED ABOVE ELEVATION 736.00

STATION 1, PLAN 1, RATIO 3

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	1.	1.	1.	1.	2.	2.
3.	3.	3.	4.	4.	4.	4.	4.	4.	4.
4.	4.	4.	4.	3.	3.	3.	3.	3.	3.
3.	3.	3.	3.	3.	2.	2.	2.	2.	2.
2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
2.	2.	2.	3.	3.	4.	4.	5.	6.	7.
8.	9.	10.	11.	12.	13.	14.	14.	15.	16.
17.	18.	18.	19.	20.	21.	22.	25.	28.	33.
39.	49.	59.	71.	83.	96.	131.	164.	197.	259.
336.	434.	517.	573.	594.	588.	564.	523.	498.	461.
422.	380.	334.	293.	257.	222.	193.	174.	155.	138.
121.	107.	96.	91.	86.	82.	77.	73.	69.	65.
61.	58.								

STORAGE

288.	288.	288.	288.	288.	288.	288.	288.	288.	288.
288.	288.	288.	288.	288.	288.	288.	288.	288.	288.
288.	288.	288.	288.	288.	288.	288.	288.	288.	288.

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
288.	288.	288.	288.	288.	288.	288.	288.	288.	288.
288.	288.	288.	288.	288.	288.	288.	288.	288.	288.
288.	288.	288.	288.	288.	288.	288.	289.	289.	289.
289.	289.	289.	290.	290.	290.	290.	290.	290.	290.
290.	290.	290.	290.	290.	290.	289.	289.	289.	289.
289.	289.	289.	289.	289.	289.	289.	289.	289.	289.
289.	289.	289.	289.	289.	289.	289.	289.	289.	289.
289.	289.	289.	289.	289.	289.	289.	289.	289.	289.
289.	289.	289.	289.	289.	290.	290.	290.	291.	291.
292.	292.	292.	293.	293.	294.	294.	294.	295.	295.
296.	294.	296.	297.	297.	297.	298.	299.	301.	303.
305.	308.	311.	315.	318.	322.	325.	329.	332.	336.
340.	344.	348.	350.	351.	351.	350.	349.	347.	346.
344.	342.	340.	338.	336.	334.	332.	330.	328.	326.
324.	323.	322.	320.	319.	318.	316.	315.	314.	313.
312.	311.								

STAGE

732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0
732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0
732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0
732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0
732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0
732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0
732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.1
732.1	732.1	732.1	732.1	732.1	732.1	732.1	732.1	732.1	732.1
732.1	732.1	732.1	732.1	732.1	732.1	732.1	732.1	732.1	732.1
732.1	732.1	732.1	732.1	732.1	732.1	732.1	732.1	732.1	732.1
732.1	732.1	732.1	732.1	732.1	732.1	732.1	732.1	732.1	732.1
732.1	732.1	732.1	732.1	732.1	732.1	732.1	732.1	732.1	732.1
732.1	732.1	732.1	732.1	732.1	732.1	732.1	732.1	732.2	732.2
732.2	732.2	732.3	732.3	732.3	732.3	732.4	732.4	732.4	732.4
732.4	732.5	732.5	732.5	732.5	732.5	732.6	732.6	732.7	732.9
733.0	733.2	733.4	733.6	733.8	734.0	734.2	734.4	734.6	734.8
735.1	735.3	735.5	735.7	735.7	735.7	735.6	735.6	735.5	735.4
735.3	735.2	735.1	734.9	734.8	734.7	734.6	734.5	734.3	734.2
734.1	734.1	734.0	733.9	733.8	733.7	733.7	733.6	733.5	733.5
733.4	733.3								

PEAK OUTFLOW IS 594. AT TIME 41.25 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	594.	351.	106.	54.	10316.
CMS	17.	10.	3.	2.	292.
INCHES		7.41	8.99	9.09	9.09
MM		188.27	228.30	230.81	230.81
AC-FT		174.	211.	213.	213.
THOUS CU M		214.	260.	263.	263.

WARNING *** TOP OF DAM, BOTTOM OF BREACH, OR LOW-LEVEL OUTLET IS NOT WITHIN RANGE OF GIVEN ELEVATIONS IN STORAGE-ELEVATION DATA
BOTTOM OF RESERVOIR ASSUMED TO BE AT 702.00
STORAGE-ELEVATION DATA WILL BE EXTRAPOLATED ABOVE ELEVATION 736.00

STATION 1, PLAN 1, RATIO 4

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

0.	0.	1.	1.	1.	1.	1.	1.	1.	1.
3.	4.	4.	4.	4.	5.	5.	5.	5.	5.
5.	5.	4.	4.	4.	4.	4.	4.	4.	4.
3.	3.	3.	3.	3.	3.	3.	3.	3.	3.
3.	3.	3.	2.	2.	2.	2.	2.	2.	2.
2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
2.	3.	3.	3.	4.	4.	5.	6.	7.	8.
9.	11.	12.	13.	14.	15.	16.	17.	18.	19.
20.	21.	22.	23.	24.	25.	27.	29.	34.	40.
50.	62.	75.	89.	113.	152.	188.	236.	289.	359.
452.	551.	639.	699.	720.	709.	680.	641.	599.	554.
507.	456.	401.	345.	297.	258.	221.	192.	173.	154.
137.	120.	106.	98.	91.	86.	82.	77.	73.	69.
65.	62.								

STORAGE

288.	288.	288.	288.	288.	288.	288.	288.	288.	288.
288.	288.	288.	288.	288.	288.	288.	288.	288.	288.
288.	288.	288.	288.	288.	288.	288.	288.	288.	288.
288.	288.	288.	288.	288.	288.	288.	288.	288.	288.
288.	288.	288.	288.	288.	288.	288.	288.	288.	288.
288.	288.	288.	288.	288.	288.	288.	288.	288.	288.
288.	288.	288.	288.	289.	288.	289.	289.	289.	289.
289.	290.	290.	290.	290.	290.	290.	290.	290.	290.
290.	290.	290.	290.	290.	290.	290.	290.	290.	290.
290.	290.	289.	289.	289.	289.	289.	289.	289.	289.
289.	289.	289.	289.	289.	289.	289.	289.	289.	289.
289.	289.	289.	289.	289.	289.	289.	289.	289.	289.
289.	289.	289.	289.	290.	290.	290.	291.	291.	292.
292.	293.	293.	294.	294.	295.	293.	296.	296.	297.
297.	297.	298.	298.	299.	299.	300.	301.	303.	306.
309.	312.	316.	320.	324.	328.	331.	334.	338.	341.
345.	349.	353.	356.	357.	356.	355.	353.	352.	350.
347.	345.	343.	340.	338.	336.	334.	332.	330.	328.
326.	324.	323.	322.	320.	319.	318.	316.	315.	314.
313.	312.								

STAGE

732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0
732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0
732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0
732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0
732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0
732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0
732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.1	732.1
732.1	732.1	732.1	732.1	732.1	732.1	732.1	732.1	732.1	732.1
732.1	732.1	732.1	732.1	732.1	732.1	732.1	732.1	732.1	732.1
732.1	732.1	732.1	732.1	732.1	732.1	732.1	732.1	732.1	732.1
732.1	732.1	732.1	732.1	732.1	732.1	732.1	732.1	732.1	732.1
732.1	732.1	732.1	732.1	732.1	732.1	732.1	732.1	732.1	732.1
732.1	732.1	732.1	732.1	732.1	732.1	732.1	732.2	732.2	732.2
732.2	732.3	732.3	732.3	732.4	732.4	732.4	732.5	732.5	732.5
732.5	732.6	732.6	732.6	732.6	732.7	732.7	732.8	732.9	733.0
733.2	733.4	733.6	733.9	734.1	734.3	734.5	734.7	734.9	735.1
735.4	735.6	735.8	736.0	736.0	736.0	735.9	735.8	735.7	735.6
735.5	735.4	735.2	735.1	734.9	734.8	734.7	734.6	734.4	734.3
734.2	734.1	734.1	734.0	733.9	733.8	733.7	733.7	733.6	733.5
733.5	733.4								

MAX OUTFLOW IS 720, AT TIME 41.25 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	720.	430.	129.	65.	12546.
CMS	20.	12.	4.	2.	355.
INCHES		9.09	10.93	11.05	11.05
MM		230.90	277.69	280.71	280.71

[illegible] 213. 250. 259. 259.
THOUS CU M 263. 316. 320. 320.

WARNING *** TOP OF DAM, BOTTOM OF BREACH, OR LOW-LEVEL OUTLET IS NOT WITHIN RANGE OF GIVEN ELEVATIONS IN STORAGE-ELEVATION DATA
BOTTOM OF RESERVOIR ASSUMED TO BE AT 702.00
STORAGE-ELEVATION DATA WILL BE EXTRAPOLATED ABOVE ELEVATION 736.00

STATION 1, PLAN 1, RATIO 5

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	2.	2.	3.	4.
4.	5.	5.	6.	6.	6.	6.	6.	6.	6.
6.	6.	6.	6.	6.	5.	5.	5.	5.	5.
5.	4.	4.	4.	4.	4.	4.	4.	4.	4.
4.	3.	3.	3.	3.	3.	3.	3.	3.	3.
3.	3.	3.	3.	3.	3.	3.	3.	3.	3.
3.	3.	4.	4.	5.	6.	7.	8.	10.	11.
13.	14.	16.	17.	19.	20.	22.	23.	24.	26.
27.	28.	29.	30.	32.	33.	35.	40.	48.	59.
73.	86.	118.	164.	213.	277.	337.	398.	456.	532.
635.	755.	863.	940.	965.	949.	908.	856.	799.	740.
676.	609.	535.	461.	389.	325.	275.	239.	204.	162.
163.	145.	128.	113.	99.	93.	89.	84.	80.	76.
72.	68.								

STORAGE

288.	288.	288.	288.	288.	288.	288.	288.	288.	288.
288.	288.	288.	288.	288.	288.	288.	288.	288.	288.
288.	288.	288.	288.	288.	288.	288.	288.	288.	288.
288.	288.	288.	288.	288.	288.	288.	288.	288.	288.
288.	288.	288.	288.	288.	288.	288.	288.	288.	288.
288.	288.	288.	288.	288.	288.	288.	288.	288.	288.
288.	288.	288.	288.	288.	289.	289.	289.	289.	290.
290.	290.	290.	291.	291.	291.	291.	291.	291.	291.
291.	291.	291.	291.	290.	290.	290.	290.	290.	290.
290.	290.	290.	290.	290.	290.	290.	290.	290.	290.
290.	290.	290.	289.	289.	289.	289.	289.	289.	289.
289.	289.	289.	289.	287.	289.	289.	289.	289.	289.
289.	290.	290.	290.	290.	291.	291.	292.	292.	293.
294.	294.	295.	296.	296.	297.	298.	298.	299.	299.
300.	301.	301.	302.	302.	303.	304.	306.	308.	311.
315.	319.	324.	329.	333.	337.	340.	343.	345.	349.
353.	358.	363.	366.	367.	367.	365.	363.	360.	358.
355.	352.	349.	345.	342.	340.	337.	335.	333.	331.
329.	327.	325.	324.	322.	321.	320.	318.	317.	316.
315.	314.								

STAGE

732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0
732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0
732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0
732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0
732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0
732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0
732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.1	732.1	732.1
732.1	732.1	732.1	732.1	732.2	732.2	732.2	732.2	732.2	732.2
732.2	732.2	732.2	732.2	732.1	73.	732.1	732.1	732.1	732.1

732.1	732.1	732.1	732.1	732.1	732.1	732.1	732.1	732.1	732.1
732.1	732.1	732.1	732.1	732.1	732.1	732.1	732.1	732.1	732.1
732.1	732.1	732.1	732.1	732.1	732.1	732.1	732.1	732.1	732.1
732.1	732.1	732.1	732.1	732.1	732.1	732.2	732.2	732.3	732.3
732.3	732.4	732.4	732.5	732.5	732.5	732.6	732.6	732.6	732.7
732.7	732.7	732.8	732.8	732.8	732.9	732.9	733.0	733.2	733.4
733.6	733.9	734.1	734.4	734.7	734.9	735.1	735.2	735.4	735.6
735.8	736.1	736.4	736.6	736.7	736.6	736.5	736.4	736.2	736.1
735.9	735.8	735.6	735.4	735.2	735.0	734.9	734.7	734.6	734.5
734.4	734.3	734.2	734.1	734.0	733.9	733.9	733.8	733.7	733.6
733.6	733.5								

PEAK OUTFLOW IS 965. AT TIME 41.25 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	965.	589.	175.	89.	17021.
CMS	27.	17.	5.	3.	482.
INCHES		12.45	14.84	14.99	14.99
MM		316.22	376.84	380.85	380.85
AC-FT		292.	348.	352.	352.
THOUS CU M		360.	429.	434.	434.

WARNING *** TOP OF DAM, BOTTOM OF BREACH, OR LOW-LEVEL OUTLET IS NOT WITHIN RANGE OF GIVEN ELEVATIONS IN STORAGE-ELEVATION DATA
BOTTOM OF RESERVOIR ASSUMED TO BE AT 702.00
STORAGE-ELEVATION DATA WILL BE EXTRAPOLATED ABOVE ELEVATION 736.00

STATION 1, PLAN 1, RATIO 6

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

0.	C.	0.	0.	0.	0.	C.	0.	0.	C.
0.	C.	0.	0.	0.	0.	C.	0.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	2.	2.	3.	4.	5.
5.	6.	7.	7.	7.	8.	8.	8.	8.	8.
8.	8.	7.	7.	7.	7.	7.	6.	6.	6.
6.	6.	5.	5.	5.	5.	5.	5.	5.	4.
4.	4.	4.	4.	4.	4.	4.	4.	4.	4.
4.	4.	4.	4.	4.	4.	4.	4.	4.	4.
4.	4.	4.	5.	6.	7.	9.	10.	12.	14.
16.	18.	20.	22.	23.	25.	27.	29.	31.	32.
34.	35.	37.	38.	40.	43.	48.	55.	65.	78.
95.	142.	192.	266.	341.	416.	478.	532.	592.	679.
802.	949.	1064.	1294.	1260.	1155.	1084.	1039.	980.	913.
838.	755.	666.	574.	486.	406.	336.	285.	244.	208.
184.	165.	147.	131.	116.	102.	94.	90.	86.	81.
77.	74.								

STORAGE

288.	288.	288.	288.	288.	288.	288.	288.	288.	288.
288.	288.	288.	288.	288.	288.	288.	288.	288.	288.
288.	288.	288.	288.	288.	288.	288.	288.	288.	288.
288.	288.	288.	288.	288.	288.	288.	288.	288.	288.
288.	288.	288.	288.	288.	288.	288.	288.	288.	288.
288.	288.	288.	288.	288.	288.	288.	288.	288.	288.
288.	288.	288.	288.	289.	289.	289.	289.	290.	290.
290.	291.	291.	291.	291.	291.	292.	292.	292.	291.
291.	291.	291.	291.	291.	291.	291.	291.	291.	291.
291.	291.	290.	290.	290.	290.	290.	290.	290.	290.
290.	290.	290.	290.	290.	290.	290.	290.	290.	290.
290.	290.	290.	290.	290.	290.	290.	290.	290.	290.

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
295.	296.	297.	298.	298.	299.	300.	301.	302.	302.
303.	304.	304.	305.	306.	306.	308.	310.	313.	317.
321.	327.	332.	336.	340.	344.	346.	349.	351.	355.
360.	367.	373.	375.	375.	374.	373.	371.	368.	365.
362.	358.	354.	350.	347.	343.	340.	337.	335.	333.
331.	329.	327.	325.	324.	323.	321.	320.	319.	318.
316.	315.								

STAGE

732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0
732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0
732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0
732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0
732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0
732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0	732.0
732.0	732.0	732.0	732.0	732.0	732.0	732.1	732.1	732.1	732.1
732.1	732.2	732.2	732.2	732.2	732.2	732.2	732.2	732.2	732.2
732.2	732.2	732.2	732.2	732.2	732.2	732.2	732.2	732.2	732.2
732.2	732.1	732.1	732.1	732.1	732.1	732.1	732.1	732.1	732.1
732.1	732.1	732.1	732.1	732.1	732.1	732.1	732.1	732.1	732.1
732.1	732.1	732.1	732.1	732.1	732.1	732.1	732.1	732.1	732.1
732.1	732.1	732.1	732.1	732.2	732.2	732.2	732.3	732.3	732.4
732.4	732.5	732.5	732.6	732.6	732.7	732.7	732.6	732.8	732.8
732.9	732.9	733.0	733.0	733.0	733.1	733.2	733.3	733.5	733.7
734.0	734.3	734.6	734.8	735.1	735.3	735.4	735.6	735.7	735.9
736.3	736.6	737.0	737.1	737.1	737.1	737.0	736.9	736.7	736.5
736.3	736.1	735.9	735.7	735.4	735.2	735.1	734.9	734.8	734.6
734.5	734.4	734.3	734.2	734.1	734.0	734.0	733.9	733.8	733.7
733.7	733.6								

AK OUTFLOW IS 1294. AT TIME 41.00 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1294.	747.	222.	112.	21517.
CMS	37.	21.	6.	3.	609.
INCHES		15.80	18.76	18.95	18.95
MM		401.24	476.43	481.45	481.45
AC-FT		371.	440.	445.	445.
THOUS CU M		457.	543.	548.	548.

********** ********** ********** ********** **********

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIO 1 0.20	RATIO 2 0.40	RATIO 3 0.50	RATIO 4 0.60	RATIO 5 0.80	RATIO 6 1.00
HYDROGRAPH AT	1	0.44	1	268.	537.	671.	805.	1073.	1341.
	(	3351.91)	(	7.60)(	15.19)(	18.99)(	22.79)(	30.39)(	37.98)(
ROUTED TO	1	0.44	1	170.	460.	594.	720.	965.	1294.
	(	3351.91)	(	4.82)(	13.04)(	16.83)(	20.40)(	27.33)(	36.65)(

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 ....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	732.00	732.00	737.00
STORAGE	288.	288.	373.
OUTFLOW	0.	0.	1092.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
0.20	734.44	0.	329.	170.	0.	42.25	0.
0.40	735.38	0.	345.	460.	0.	41.50	0.
0.50	735.72	0.	351.	594.	0.	41.25	0.
0.60	736.05	0.	357.	720.	0.	41.25	0.
0.80	736.67	0.	367.	965.	0.	41.25	0.
1.00	737.14	0.14	375.	1294.	0.75	41.00	0.

APPENDIX D

REFERENCES

APPENDIX D

REFERENCES

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3) H.W. King and E.F. Brater, Handbook of Hydraulics, 5th edition, McGraw-Hill, 1963.

4) T.W. Lambe and R.V. Whitman, Soil Mechanics, John Wiley and Sons, 1965.

5) W.D. Thornbury, Principles of Geomorphology, John Wiley and Sons, 1969.

6) University of the State of New York, Geology of New York, Education Leaflet 20, Reprinted 1973.

7) Cornell University Agriculture Experiment Station (compiled by M.G. Cline and R.L. Marshall), General Soil Map of New York State and Soils of New York Landscapes, Information Bulletin 119, 1977.

APPENDIX E

STABILITY ANALYSIS

INVESTIGATION

OF

FOUNDATION AND DESIGN

HERALD TRIBUNE FRESH AIR FUND DAM

FISHKILL, NEW YORK

for

UNITED STATES DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE

Upper Darby, Pa.

By

Louis Berger

Soils Consultant

June 30, 1950

TABLE OF CONTENTS

FRESH AIR FUND

INVESTIGATION OF FOUNDATION AND DESIGN

HERALD TRIBUNE FRESH AIR FUND DAM

Fishkill, New York

Summary:

A compacted earth fill dam about 50 feet in maximum height and 800 feet long has been proposed near Fishkill, New York, at the Pioneer Camp of the Herald Tribune Fresh Air Fund. The left abutment consists of a massive granitic rock outcrop covered in spots by a thin mantle of boulder clay. The valley and right abutment consist of a compact deposit of glacial boulder clay. Analysis of the foundation soils indicated a high shearing resistance and low permeability. The foundation was judged excellent and fully competent to carry the load of the proposed dam without danger of over-stress or of excessive settlement. The material for the compacted fill dam is to be obtained from borrow pits downstream of the structure. For a crest elevation of 505, about 135,000 cubic yards of fill will be required with an average haul distance of 750 feet to the mass center of the dam.

The glacial boulder clay available for fill is high in silt and very sensitive to moisture conditions when compacted. At water contents of 13 to 15 per cent, very high densities and shearing strengths are obtained. At water contents over 16.5 per cent, the fill is soft and rubbery and had inadequate strengths and densities regardless of the amount of work expended in compaction.

Borrow areas upstream of the proposed site were not considered because the soils in that area were found too wet to be used when the field studies were made in May 1950. If the water content of the borrow material is properly controlled in the field, then five passes of a tractor-drawn sheepsfoot roller will undoubtedly produce fill of adequate strength to permit upstream slopes of 1 on 3 and downstream slopes of 1 on 2.5.

An internal seepage drain has been designed to intercept seepage through foundation and fill. A compacted clay cut-off trench is proposed to cut off flow through thin pervious foundation strata.

Erosion control measures are required on this dam. Thirty inches of riprap are proposed between elevation 490 and 505 on the upstream face for protection against wave wash. A 12-inch gravel blanket is proposed on the downstream side, with an alternate of seeding and mulching. A 5-foot pervious sand and gravel fill of local material would be desirable on both upstream and downstream slopes.

Investigation of Foundation and Design

Herald-Tribune Fresh Air Fund Dam

Fishkill, New York

I. Introduction

(a) Nature of the Project

1. The proposed Herald-Tribune Dam is to be of the compacted earth fill type, approximately 800 feet long, and with a maximum height of approximately 50 feet. The site selected is about 5 miles southeast of Fishkill, New York, at the Pioneer Fresh Air Fund Camp of the New York Herald-Tribune. The pond created by this dam will be used for recreational purposes by underprivileged children from New York and adjacent urban areas.

(b) Scope of this Report

2. The results of the foundation investigation and soil mechanics for the Herald-Tribune Dam are presented in this report. The investigation consisted of an inspection and foundation exploration of the dam site, laboratory tests on the foundation materials and the materials available for the compacted embankment, analysis of the proposed dam for stability, and analysis of various other design and construction features. The hydrology of the project, the design of hydraulic appurtenances, and the economics of the project were not considered in this report.

(c) Personnel

3. A field inspection of the proposed dam site was made by Mr. W. S. Atkinson, Regional Engineer; Mr. Glenn Grubb, Design Engineer; and Louis Berger, Soils Consultant of the Soil Conservation Service. The inspection was made on May 2 and 3, 1950, and at that

time field samples of borrow and foundation materials were obtained.

II. The Exploration Program

Foundation Borings and Test Pits

4. The foundation exploration at this site consisted of a series of auger borings in the proposed borrow and foundation area and 5 test pits excavated to a depth of approximately 8 feet below natural ground or to rock. The location of these borings and of the test pits are shown on Figure 2. The summary of the natural water contents is presented in Table 1. Test pit No. 3, which was located close to the centerline of the proposed structure at a section where the embankment fill would be a maximum, was selected as the best location for undisturbed foundation samples. The initial efforts were to obtain 2-inch shelby tube samples. The nature of the glacial boulder clay was such that only one sample of this size was successfully obtained. Field examination revealed that many of the stones in the foundation material were larger than 2 inches in diameter. Since 5 shelby tube samplers had been damaged beyond repair in recovering this one sample, further efforts to obtain the 2-inch size samples were not made. Several attempts were made to obtain 3-inch diameter undisturbed shelby tubes samples, but because of the large number of stones, the sampling tubes were damaged, and no further attempts could be made to recover samples of this diameter. The final undisturbed sampling was done with 5-inch shelby tubes. Four attempts produced two samples each 5 inches in diameter and approximately 15 inches long. One of these samples was of the yellow foundation clay extending from a depth of approximately 2 to 6 feet below natural ground, and the other represented a stratum

of blue clay beginning 6 feet below the surface and extending to at least 10 feet below natural ground.

Exploration of Borrow Areas

Borrow areas were originally proposed both upstream and downstream of the proposed dam site. A large number of auger borings were made in both areas, but because of the stony character of the glacial clay, very few of these borings could be made to a depth greater than 8 feet below natural ground. Most borings had to be abandoned within 36 inches of the surface because of the presence of large rocks which could not be penetrated. All of the borings and test pits revealed a compact gravelly or stony glacial boulder clay. There was a lack of homogeneity of the clay in any specific area, but there was a sufficient uniformity in the character of this boulder clay in all areas to make a large number of borrow pits or auger borings unnecessary. Two of the test pits on the right abutment were considered to represent typical boulder clay conditions at this site and were selected as the source for samples of the borrow materials. Composite samples were taken to represent the strata from 2 to 4 feet, 4 to 6 feet, and 6 to 8 feet. Visual examination of this material in the field indicated that it was a gravelly, sandy, glacial silt containing some clay and some boulders. There appeared to be very little visual difference in the texture of the fines of each of these strata. The major difference appeared to be in the quantity of gravel present, and the deeper samples seemed to be more gravelly. Jar samples were obtained for moisture contents,

and large sack samples were obtained for running proctor, remolded consolidation, triaxial, and direct shear tests.

III. Laboratory Testing Program

Test Procedures

7. The test procedures that were used in analyzing this material follow the standards established by the American Society of Testing Materials and the American Association of State Highway Officials. Full details can be obtained by reference to the "LABORATORY TESTING MANUAL" published by F. M. Dawson, Pitman Publishing Company, New York. Photographs of the equipment used are included in the Appendix.

Classification Tests

8. Particle size analyses of the borrow pit samples, the foundation samples, and the auger boring samples were made by the combined sieve and hydrometer method. The percentages of clay, silt, sand, and gravel present are shown in Table 1 and Figure 3. The equipment used in the performing these particle size determinations is shown as photograph P-1.

9. Atterberg limits of consistency. The liquid and plastic limits of representative samples from the test pit and foundation were determined, and these limits, as well as the plasticity indices, are presented in the summary Table No. 1. The Atterberg limits in themselves have no specific engineering use but are extremely valuable in dividing the various soil types into specific groups for classification purposes. The equipment used in making Atterberg limit analyses is shown on photograph P-2.

10. Water content and specific gravity determination. Natural water content determinations were made on the undisturbed samples and all jar samples which were obtained in the field. The results of these determinations are shown in Table 1. Specific gravity determinations were made on typical samples of the borrow and undisturbed foundation material. The results varied from 2.69 to 2.73. These data were used for hydrometer, consolidation, and triaxial compression computations.

Selection of Representative Samples for Special Tests

11. The shearing strength characteristics, the compressibility, and the permeability of the foundation material were required in designing the dam. The engineering properties of the foundation material are based on direct shear and consolidation tests of specimens taken from the pit No. 6. Visual classification, as well as laboratory determinations, indicated that the yellow clay from 2 to 6 feet below natural ground surface was considerably different from the blue clay existing below 6 feet. For that reason, a complete set of consolidation-permeability tests and shear tests were made on both types of material.

12. Borrow materials. Grain-size analyses of the borrow pit samples indicated some variation in the texture at the various elevations. Consolidation tests were performed on two samples from each borrow stratum, that is, 2 to 4, 4 to 6, and 6 to 8 feet. Unconfined compression tests for determining shearing strength were also performed on samples from each of these elevations. A further study was made of the properties resulting

when the three types of material were mixed together as they will be when the borrow material is placed in the embankment.

Special Tests

13. Compaction. Proctor compaction tests were made on the borrow material samples from each elevation to determine their general compaction characteristics and to establish the optimum water content for maximum density and shearing strength under any field conditions. This maximum density-optimum water content was also used as a guide for compacting specimens to be used for consolidation, triaxial, and unconfined compression tests. Each of the materials designated as A, B, and C were compacted by the standard Proctor Method, using 25 blows of a 5½-pound hammer dropped a distance of 12 inches, with the test being performed in a standard cylinder having a volume of 1/30 of a cubic foot. The results of these tests are presented on plate 4. A photograph of the standard cylinder and hammer is shown as P-4. The compaction molds used for making consolidation and triaxial compression tests samples are indicated in P-5. In accordance with standard procedure, all of the borrow material samples were screened through a ¾-inch mesh, thereby removing about one-quarter of the weight, consisting of stones from ¾ inch to 6 inches in diameter, which comprise about 20 to 30 per cent of the wet weight of the soil.

14. Consolidation tests. Consolidation tests were performed on the types of undisturbed foundation samples and on

two samples of each of the 3 strata of borrow material selected as representative in the dam site area. The results of these consolidation tests are presented in Figures 3 through 14, inclusive. The compression index for these materials is tabulated in Table 2.

15. Permeability. Permeability tests were made on the undisturbed foundation samples and on the compacted borrow material samples in conjunction with the consolidation test. For each series of consolidation tests, permeabilities were determined at 3 void ratios in order to obtain an average relationship of void ratio to permeability under various normal pressures. The permeabilities obtained are tabulated in Table 2.

The undisturbed consolidation tests samples were extremely difficult to prepare from the 5-inch Shelby tube samples because of the large number of stones present. In several cases, a large stone was found protruding from the side or top after the samples were practically down to final size. Several samples were rejected until it was found that this was the general condition, and if any undisturbed tests were to be made at all, then one or more stones would have to be plucked out and the cavity filled. The consolidation tests of the remolded samples were made on material smaller than $\frac{1}{4}$ inch in diameter. All gravel and stones comprising about 25 per cent of the initial wet weight of the samples were removed, since the inclusion of this material would have made the tests impossible to perform in the laboratory with standard equipment.

16. Shearing strength determination. The shearing strength

characteristics of the foundation and embankment materials were investigated by direct shear, unconfined compression, and triaxial compression tests. Photographs of the equipment used are given in photographs P-7 to P-12. Direct shear test samples were cut from the 5-inch shelby tube samples and measured $3\frac{1}{2}$ inches by $1\frac{1}{4}$ inches thick. The presence of the large stones throughout the samples necessitated some patching of direct shear specimens as indicated for consolidation also. This disturbance of the specimens was taken into consideration in evaluating the results of these direct shear tests. A number of undisturbed samples were trimmed for triaxial testing, but due to the large number of stones present, the specimens resulting were so poor that they could not be used. The results of the direct shear tests are presented in Figures 15 and 16.

The shearing strength of the borrow materials was investigated by unconfined compression tests and one series of triaxial tests. The samples used were 2 inches in diameter by 4 inches long. The results of these tests are indicated in Figures 17 through 22(b), inclusive. Composite samples containing equal parts of soil from the A, B, and C strata were likewise tested and produced results essentially similar to those indicated in Figures 17 to 20 for the individual strata. A summary of the shearing strength versus water content and density of recompacted composite borrow samples is presented in Figure 22(b).

IV. Analysis and Application of Test Results

Consolidation of Foundation

The consolidation of the foundation under the main section of the dam was computed from the data obtained by consolidation of the laboratory test samples. The total magnitude of the settlement under the maximum height of fill is 1.28 feet, assuming 56 feet of clay overlying rock. The time required for this settlement to occur was seven months, which is probably less than the total construction period of this structure. If the construction requires that period of time, then total foundation consolidation in the valley section will occur during construction, and no allowance in the final net grade of the dam is necessary to take care of this foundation settlement.

Compaction and Consolidation of the Embankment

17. Relation between the compaction and the consolidation. The amount of settlement that will occur in this embankment after construction is completed is directly related to the density of the fill placed in the embankment. If the specifications require the contractor to produce at least 95 per cent of theoretical optimum compaction, then the additional settlement of this embankment after construction will be negligible.

18. Optimum water content and density. The optimum water content of the borrow material varied from 15.2 to 16.7 per cent and the corresponding densities from 116 to 111 pounds per cubic foot. Materials A and B appear to have a considerably higher optimum density than material C. This variation in density is

based on the portion of soil finer than ½ inch in diameter. This "C" material contains in place a larger percentage of coarse material and probably will ultimately attain about the same density as material A or B. Such variations in density are to be expected in glacial boulder clays of this type and will undoubtedly be encountered repeatedly throughout the construction. This borrow material was found to turn rubbery and spongy at water contents of approximately 16½ per cent, and it should be placed in the field at water contents below this magnitude. All of these borrow materials are expected to readily attain a compacted wet density of between 130 and 140 pounds per cubic foot, with a minimum of compaction effort.

19. Field compaction. The laboratory compaction tests made in this investigation are by no means adequate for field control during construction. The range in optimum water content is not wide, but the variations in material to be encountered in the field may be sufficiently large to necessitate frequent field compaction control tests. Compaction tests will be required and should be performed on each type of material used in the embankment, and these results should be carefully correlated with the results of the test made in the laboratory.

Strength Analysis

20. Strength-deformation characteristics. Despite the extreme care with which the tests for shearing strength were carried out in the laboratory, it is recognized that the soil strength results determined in the laboratory are by no means exactly comparable with the actual shear strength of the materials in the

field. The large quantities of gravel and boulders in the foundation will undoubtedly help produce a strength in the field that will be somewhat higher than that indicated in the laboratory. The samples tested in the laboratory not only had these stones removed but were also slightly disturbed in being placed in the sampling tubes and testing device. The best undisturbed samples probably also undergo some volumetric changes in being removed from their natural location in the ground. These factors cannot be accurately evaluated, and for these reasons the true soil strength is impossible to obtain. The strengths which were obtained are the best evaluations now possible with existing sampling and testing methods and are probably 10 to 25 per cent below the true strength. The strength values which are being used can therefore be considered as slightly conservative and on the safe side.

21. Strength of the foundation material. The shearing strength of the foundation material used for design purposes is based on direct shear tests of the undisturbed samples. The angle of internal friction was taken as an average of 16 degrees and the cohesion established at [illegible] pounds per square foot.

22. Strength of the embankment. The average strength of the embankment material was determined from the unconfined and triaxial tests of the composite samples extrapolated to a saturated condition where the strength at each density would be a minimum. The strength that will be obtained in the actual dam depends upon how well the fill is compacted. For this type material there should be no difficulty obtaining 111.9 pounds per cubic foot, and

at this density a cohesion of 325 pounds per square foot and a friction angle of 16 degrees can be used.

23. <u>Stability analyses</u>. Stability analyses of this embankment were made under the assumptions of a 1 on 2½ slope, a 1 on 3, and a 1 on 3½ slope. These analyses were made along a cross section through the valley foundation section A-A where the embankment height was approximately [illegible] feet and also on a cross section through the abutment, section B-B, where the embankment was approximately 25 feet in height. For each slope a number of possible failure surfaces were analyzed to determine that particular failure surface having the lowest factor of safety. For each of the proposed failure surfaces three conditions of stability were investigated. They are:

a. The factor of safety of the embankment during the period of construction;

b. The factor of safety of the embankment as the reservoir is filled up to maximum pool elevation of 500;

c. The factor of safety of the embankment if the reservoir were very suddenly drawn down from pool elevation to an elevation of 455.

The factor of safety against failure along any of these proposed sliding surfaces is defined as the sum of the shearing resistance forces along the sliding surface divided by the sum of the driving forces produced by the unbalanced weight of the embankment and any external forces due to the water pressure on the embankment. The shearing resistance can be computed by measuring the

length of arc along the failure surface and multiplying that length by the unit cohesive resistance of the material. The frictional resistance can be obtained from the coefficient of friction times the resultant pressure derived from the weight of the embankment acting normal to the sliding surface. The total resistance moment, therefore, can be computed as the radius length times the sum of the cohesive and frictional resistances. The driving moment causing failure of the embankment can be taken as the total weight of soil above the failure surface times the centroidal distance of this soil weight from the center of rotation. This method of analysis is known as the circular arc method and is described in all texts on embankment stability. During construction, the weight of the embankment is derived solely from the wet weight of the soil placed in the fill. After construction is completed and water fills the reservoir, the buoyant effect of the water reduces the weight of the soil to its submerged value, which is 62.4 pounds per cubic foot less than the wet weight during construction. Consequently, when the reservoir is filled with water it will have a much higher factor of safety than during construction. For embankment materials with low permeabilities as will be used in this dam, the lowest factor of safety always occurs during a sudden drawdown of the reservoir. In this case, water within the interior of the embankment does not have a chance to drain out of the voids rapidly enough to keep balance with the water pressure in the reservoir. Consequently, the driving force remains the total wet weight of the embankment soil, but the frictional resistance is reduced by the

effect of uplift pressure along the failure surface. In view of the conservative determination of shearing strength from the laboratory test analyses and the severity of the sudden drawdown requirement, a factor of safety of 1.0 against sudden drawdown is generally used as the criterion for determining the design slope and was also used for designing this embankment. The analyses are shown in detail on Figures 23, 24, and 25, Figures 26 and 27, and are tabulated in Table 3. A slope of 1 on 3 has been selected for the upstream face of the embankment, and a slope of 1 vertical on 2½ horizontal has been selected as a suitable slope for the downstream portion of the embankment. In evaluating the critical stability of the downstream section, it is important to note that seepage forces and sudden drawdown do not affect the downstream face, and consequently the most critical condition will be during construction.

14. <u>Seepage through the embankment</u>. Permeability values for the compacted embankment materials are given in Table 2. The character of the glacial material and the method of placement in thin horizontal layers are such that horizontal permeabilities are generally greater than permeabilities in a vertical direction. The absolute difference in permeability or the ease with which water can pass in a horizontal versus a vertical direction for this embankment is almost impossible to evaluate. From practical experience, it is generally considered that a horizontal permeability approximately nine times the vertical permeability should be used as a reasonable value. A study of the permeability data also

indicated that the average permeability of the foundation material was approximately four times the permeability of the compacted embankment material. The reason for this difference in permeability is largely due to the fact that many thin lenses and streaks of coarser fairly granular material are found in the natural foundation, while the same material, when thoroughly mixed and placed in the embankment, will have a much lower permeability.

A flow net representing the seepage through the embankment under the conditions of a variation of nine times as rapid a flow in a horizontal versus a vertical direction and a foundation permeability four times as great as the embankment permeability is represented in Figure 38(a)(b). These computations indicate that the quantity of seepage through the embankment will very from 20 to about 160 gallons per minute, depending on the compaction obtained.

25. Seepage through the foundation area. Many thin lenses of granular material were observed in the test pits and are a common occurrence in glacial clays. To prevent excessive water loss through these lenses, it is considered desirable to construct a seepage cut-off close to the centerline of the structure. The basic purpose of this cut-off will be to prevent seepage along the contact between fill and natural ground and to break the continuity of any pervious seams in the foundation. This cut-off should be excavated to a minimum depth of 8 feet and should be backfilled with the most impervious clay available. This backfill should be compacted with sheepsfoot rollers to assure maximum density and

minimum permeability. The base width of this cut-off trench will be governed by the size of bulldozers at this site, since they will presumably be used for moving the sheepsfoot rollers and possibly for making this excavation. A minimum base width of 8 feet is desired and should be maintained in the valley section and right abutment. The left abutment of the dam is a large, irregularly shaped rock outcrop with a thin mantle of clay in spots. It would obviously be impossible to excavate a trench in this left abutment, and because of the irregularity of the boulders or large outcrops, compaction of fill over the irregular surface would be extremely difficult. To eliminate contact seepage between the rock foundation and fill, it is proposed that a low cut-off wall approximately 4 feet high be constructed along the left abutment. Because of the irregularity of elevation of the rock surface, the height of the wall will vary, and the top surfaces can either be stepped or sloping. This cut-off wall should be anchored to the ledge rock with properly spaced anchor bolts. Blasting of a key in the rock is not essential, and any crevices in the ledge, if filled with compacted clay, need not be cleaned out.

26. Drainage provisions. Drainage provisions are required in a structure of this type to prevent the outcropping of seepage on the downstream face of the dam and, secondly, to prevent any foundation seepage water from outcropping at the downstream toe. The original foundation explorations at this site did not include any deep borings in the valley and abutment areas to determine whether any granular materials might exist at an appreciate depth

below natural ground surface. This information would have been desirable but was not considered urgent from the stability standpoint, inasmuch as the general geology of the area indicated only rock and a very compact boulder clay. The presence of soft, unstable strata underlying the foundation appears extremely unlikely from the geological standpoint, and the determination of whether check borings shall be made depends on whether positive assurance is worth the added expense. The presence of pervious strata at some depth below the test pit base elevations was not considered important, since the auger borings and test pits indicated a blanket of at least 8 feet of impervious boulder clay over the entire reservoir area, which would in effect keep the leakage from the reservoir down to a very small amount. The seepage interceptor within the interior of the dam serves a double purpose: in drawing down the embankment seep lines and cutting off the seep lines passing through the foundation. The details on the design of this interior drain are indicated in Figure 29.

Drainage provisions are also extremely essential to prevent sheet erosion on the downstream face of the dam. One method would be to sod the downstream face or to seed and mulch the slope and to provide sodded grass outlets along the berm and at the intersection of the slope and the natural ground. A second method would be to use a 12-inch gravel blanket over a 5-foot thickness of sand fill. This gravel blanketed sand fill would absorb all of the precipitation. Provisions should be made for interior drainage by means of tile to take care of the run-off during any period of heavy precipitation.

V. Conclusions and Recommendations

Foundation Conditions

27. Field observations and a study of laboratory test data indicate that the foundation conditions at the proposed site of the Herald-Tribune Dam are excellent. The compacted glacial boulder clay existing at this site will have a shearing strength equal to or greater than that of the compacted fill to be placed in the embankment. The foundation stability is more than adequate for a structure of the height contemplated. The only preparation necessary for this foundation will be to remove or strip all of the topsoil present from under the proposed embankment. This topsoil is 1 foot or less in thickness.

Borrow Materials for Compacted Fill

28. The materials obtained from the proposed borrow areas were tested and found completely satisfactory for the construction of a compacted earth fill dam built in accordance with the designs recommended in this report. The material reaches a high density and strength under standard compaction at water contents of 13 to 15 per cent, but is very sensitive to variations in moisture content. When this soil has a water content over 16.5 per cent, it is very difficult to compact. Regardless of the amount of compaction, the soil remains rubbery and has a low shearing strength.

Location of Borrow Areas

29. In making the investigation of the proposed borrow areas, it was found that the water contents on the upstream side of the proposed dam site were considerably higher than the water contents

of the soil located downstream of the proposed site. In view of the extremely sensitive character of this glacial boulder silt, it is recommended that only the downstream borrow areas be used. The area designated in Figure 2 contains 160,000 cubic yards of soil, with suitable water content and suitable strength for the dam. The observations made on the upstream borrow site occurred in May following a period of heavy rainfall. Further investigations made during the construction period may indicate that the upstream borrow pit has dried up sufficiently to permit use of this soil. Except for water content, the essential character of the material from both the upstream and downstream locations was nearly identical. The specific location of the borrow pit is dictated by several important restrictions. First, the borrow area should not be located closer than 100 feet from the upstream or downstream toes of the structure. The proximity depends upon the height of the nearest adjacent part of the embankment, and the distance was increased to 200 feet when the embankment height adjacent reached 45 feet. The side slopes of the cut in a borrow area should not be steeper than 1 on 4. The bottom slope of the borrow pit can have a 1 per cent slope. All large boulders encountered during the borrow pit excavation should be removed to use for the upstream toe riprap and should not be included in the fill.

Control of Embankment Compaction

30. In view of the extremely wide variations in texture that occur in glacial material, no specific rules regarding the exact

water content and compacted density can be given. If the water content of the borrow material is kept between 12 and 15 per cent, it should be possible to get adequate compaction with the designed shearing strength after approximately five passes of a tractor-drawn sheepsfoot roller having foot pressures of between 200 and 250 pounds per square inch on soil layers placed 3 inches thick. Extremely careful field control will be necessary, and numerous control tests will be required. Whenever the compacted fill assumes a rubbery appearance and weaves under the sheepsfoot roller or hauling equipment, then the compacted density should be looked on with extreme suspicion and careful checks made to insure adequate strength.

Recommended Design

31. Upstream slope. The design of the upstream slope was determined on the basis of the stability under the most critical condition of rapid drawdown of the reservoir. Under this critical condition, using the strength of fully saturated borrow materials, at a density of 111.9 p. c. f., which can easily be obtained in the field, it was determined that an adequate factor of safety for this structure would be obtained by an upstream embankment slope of 1 on 3.

32. Downstream slope. Stability analyses indicated that since the downstream section was not affected by rapid drawdown conditions, the proposed slope of 1 on $2\frac{1}{2}$ would be adequately safe against failure.

33. Drainage provisions. An internal seepage drain partially above and partially below natural ground has been proposed and is indicated in Figure 29. This drain is intended to compensate for

APPENDIX

TABLE #1

Summary Sheet

Natural Water Content

Sample		Depth	Moisture
T. P. #1	#1	24"	16.5%
	#2	36"	11.3%
	#3	50"	29.2%
	#4	50"	16.1%
T. P. #2	#5	℄ 6 + 75 18 - 30"	22.3%
	#6	7 + 75 36 - 42"	25.5%
	#7	8 + 46 24 - 30"	15.1%
T. P. #3	#8	18"	15.8%
	#9	48"	11.3%
Old ℄ 10 + 50		18 - 30"	23.9%

Borrow

Sample #5 ℄ 6 + 75   18 - 30"   (L. L. = 25.3) (P. L. = 19.0)   P. I. = 6.3

Blue Undist. Clay - T. P. #3 - 6'. depth (L. L. = 16.6) (P. L. = 13.5)   P. I. = 3.1

TABLE #2

Location	e_o	e_f	e av.	$P_o - P_f$	50% U t. Lab. Sec.	$\frac{e_o - e_f}{P_o - P_f}$	$\frac{T}{t}$	$\frac{H^2}{1 + e_{av}}$	K* Value	K* Average	C_c **
New Test Pit	.540	.512	.526	0.5	360	.056	.000547	7.00	21.4		
Undist. B Horiz.	.512	.483	.500	1.0	120	.024	.00164	7.05	27.7	20.0	.113
2' - 6'	.483	.464	.476	2.0	390	.012	.000505	7.18	4.35		
	.464	.428	.446	3.5	120	.0103	.00164	7.32	3.05		
New Test Pit	.454	.433	.443	0.5	430	.042	.00041	10.05	17.3		
Undist. Blue Clay	.433	.412	.423	1.0	78	.021	.00253	10.2	54.2	28.0	.089
6' - on	.380	.358	.369	3.5	180	.00623	.001095	10.6	7.3		
Remolded Top	.464	.444	.454	0.5	180	.040	.001095	7.28	31.9		
#1 2' - 4' (A)	.444	.417	.4305	1.0	120	.027	.00164	7.35	32.5	24.0	.105
	.417	.392	.4045	2.0	102	.0125	.00193	7.53	18.2		
	.392	.371	.3815	3.5	66	.006	.00298	7.66	13.7		
Remolded Middle	.430	.422	.4260	0.5	180	.016	.001095	7.43	13.0		
#1 4' - 6' (B)	.422	.413	.418	1.0	198	.009	.000995	7.47	6.7	8.5	.073
	.413	.397	.405	2.0	168	.008	.00117	7.54	7.05		
	.397	.380	.3885	3.5							
Remolded Bottom	.460	.444	.452	1.0	600	.016	.000328	7.28	2.92		
#1 6' - 8' (C)	.421	.444	.432	2.0	360	.0115	.000547	7.39	4.65	7.0	.0735
	.386	421	.404	3.5	120	.010	.00164	7.54	12.4		

K*: These values have to be multiplied by 10^{-5} cm. per second

** Compression Index = $\frac{\Delta e}{\Delta \log P}$, where $\Delta \log P$ = 1 cycle

TABLE 3

Summary of Stability Analyses
Upstream Slope ~ Valley Section
Factors of Safety

Slope 1 on 2½

Arc	θ°	B°	During Construction	Reservoir Full	Sudden Drawdown
1	56.4	21.8	1.42	1.96	1.028
2	64.1	19.0	1.29	1.65	.860
3	97.0	19.0	1.33	1.63	.853
4	81.5	16.0	1.46	1.75	.925
5	81.5	17.5	1.37	1.68	.883
6	47.9	21.8	1.49	2.11	1.080
7	51.2	21.8	1.46	2.05	1.068
8	69.4	19.0	1.30	1.66	.870
9	74.4	19.0	1.31	1.66	.870
10	77.0	16.5	1.48	1.76	.945
11	97.0	15.5	1.51	1.78	.956

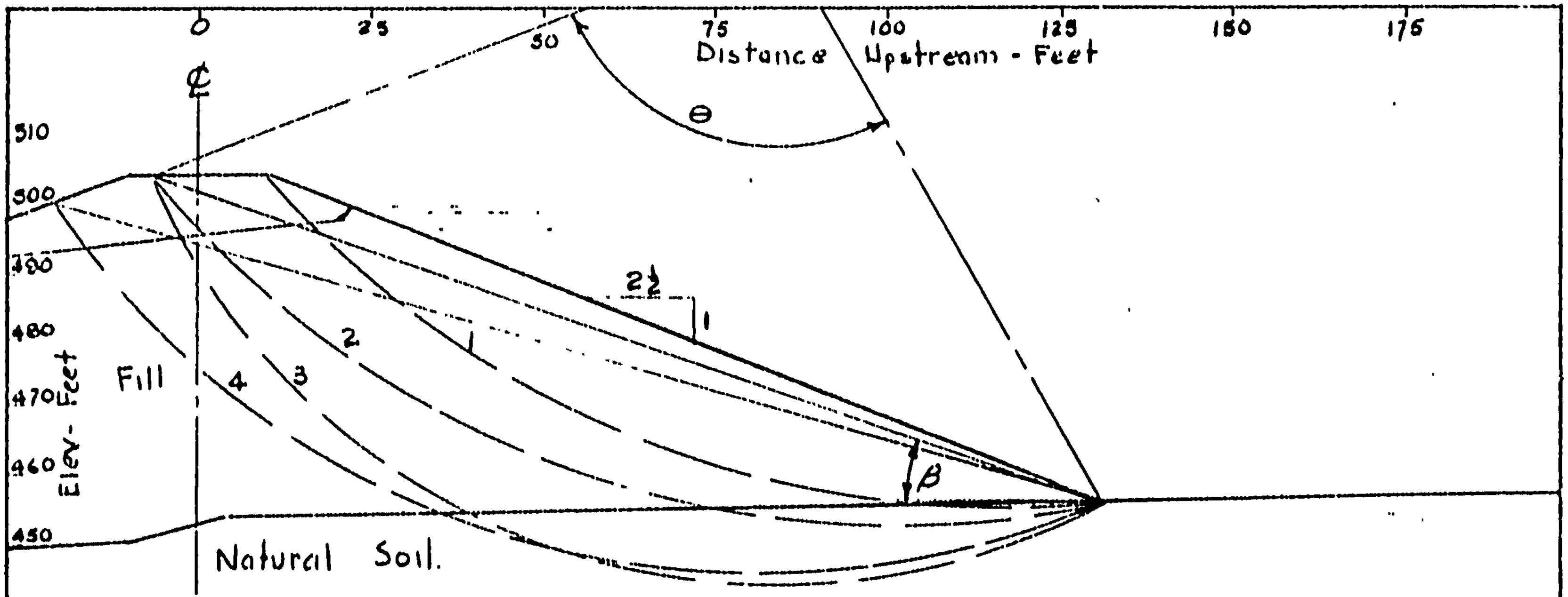
Slope 1 on 3

1	36.5	13.4	2.01	2.99	1.580
2	64.0	13.0	1.51	1.96	1.042
3	82.5	14.5	1.54	1.88	1.005
4	90.0	14.5	1.64	1.95	1.037
5	97.0	14.5	1.67	1.96	1.059
6	103.5	14.5	1.72	2.01	1.080
7	71.8	15.8	1.50	1.87	.990
8	77.0	15.5	1.52	1.87	.995
9	33.8	13.4	2.22	3.36	1.781
10	41.0	18.4	2.17	3.25	1.740
11	58.0	13.0	1.60	2.08	1.104
12	71.0	18.0	1.60	2.02	1.076

Slope 1 on 3½

1	59.0	15.5	1.665	2.14	1.143
2	58.5	15.9	1.76	2.33	1.241
3	58.5	13.0	1.77	2.22	1.186
4	56.0	15.5	1.70	2.21	1.178
5	62.5	15.5	1.70	2.16	1.155
6	58.5	10.0	2.20	2.64	1.426

$H = 50'$; $\gamma = 135$ Lbs./Cu. Ft. ; $C = 325$ Lbs./S.F. ; $\tan\phi = .29$

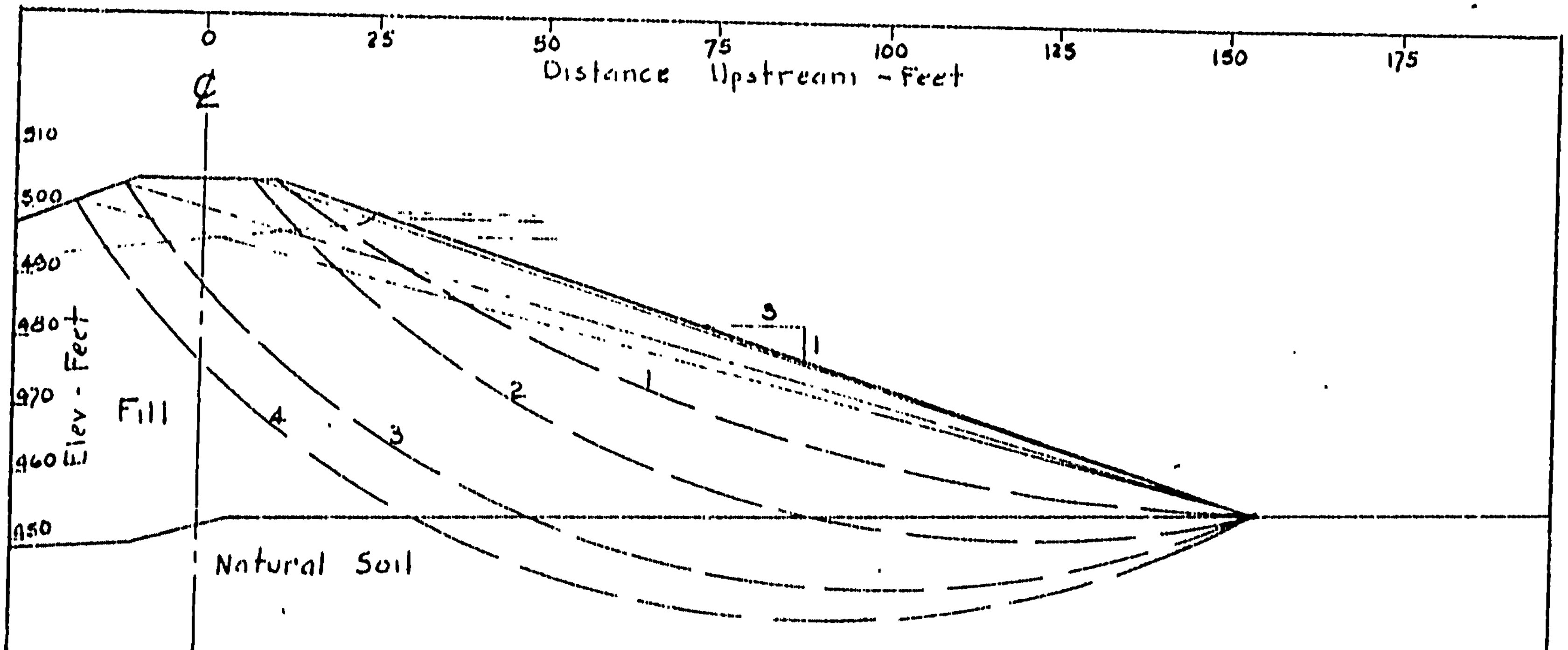


Arc	θ	β	Factor of Safety		
			During Construction	Reservoir Full	Sudden Drawdown
1	56.4°	21.8°	1.42	1.96	1.028
2	64.1°	19.0°	1.29	1.65	0.86
3	97.0°	19.0°	1.33	1.63	0.853
4	81.5°	16.0°	1.46	1.75	0.925

SOIL CONSERVATION SERVICE
INVESTIGATION OF FOUNDATIONS AND DESIGN
HERALD TRIBUNE DAM
FISHKILL, NEW YORK

VALLEY SECTION - SECTION A-A

FIG. 23



Arc	θ	β	Factor of Safety: During Construction	Factor of Safety: Reservoir Full	Factor of Safety: Sudden Drawdown
1	36.5°	18.28°	2.01	2.99	1.58
2	64.0°	18.0°	1.51	1.96	1.042
3	82.5°	15.8°	1.54	1.88	1.005
4	90.0°	14.5°	1.64	1.95	1.037

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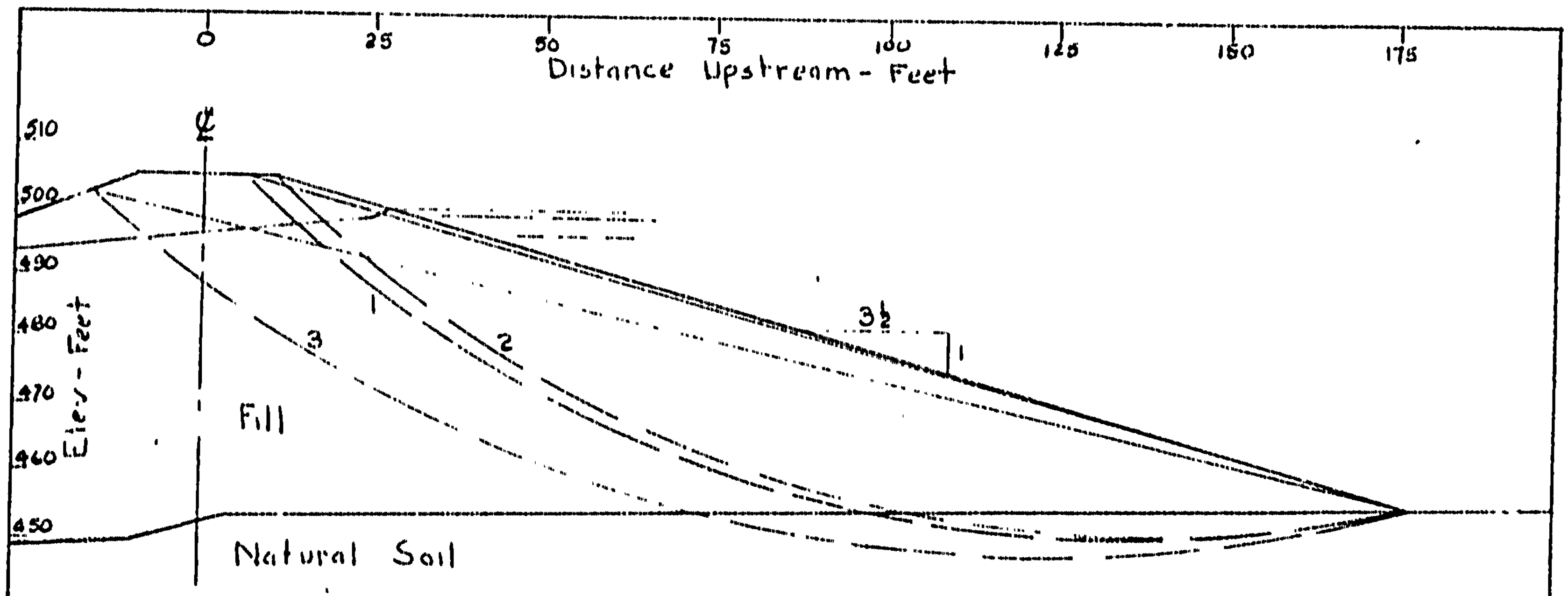
HERALD TRIBUNE DAM
FISHKILL, NEW YORK

VALLEY SECTION - SECTION A-A

FIG. 24



Arc	Θ	β	Factor of Safety		
			During Construction	Reservoir Full	Sudden Drawdown
1	59.0°	15.5°	1.665	2.14	1.143
2	58.5°	15.9°	1.77	2.33	1.241
3	58.5°	13.0°	1.77	2.22	1.186

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HERALD TRIBUNE DAM
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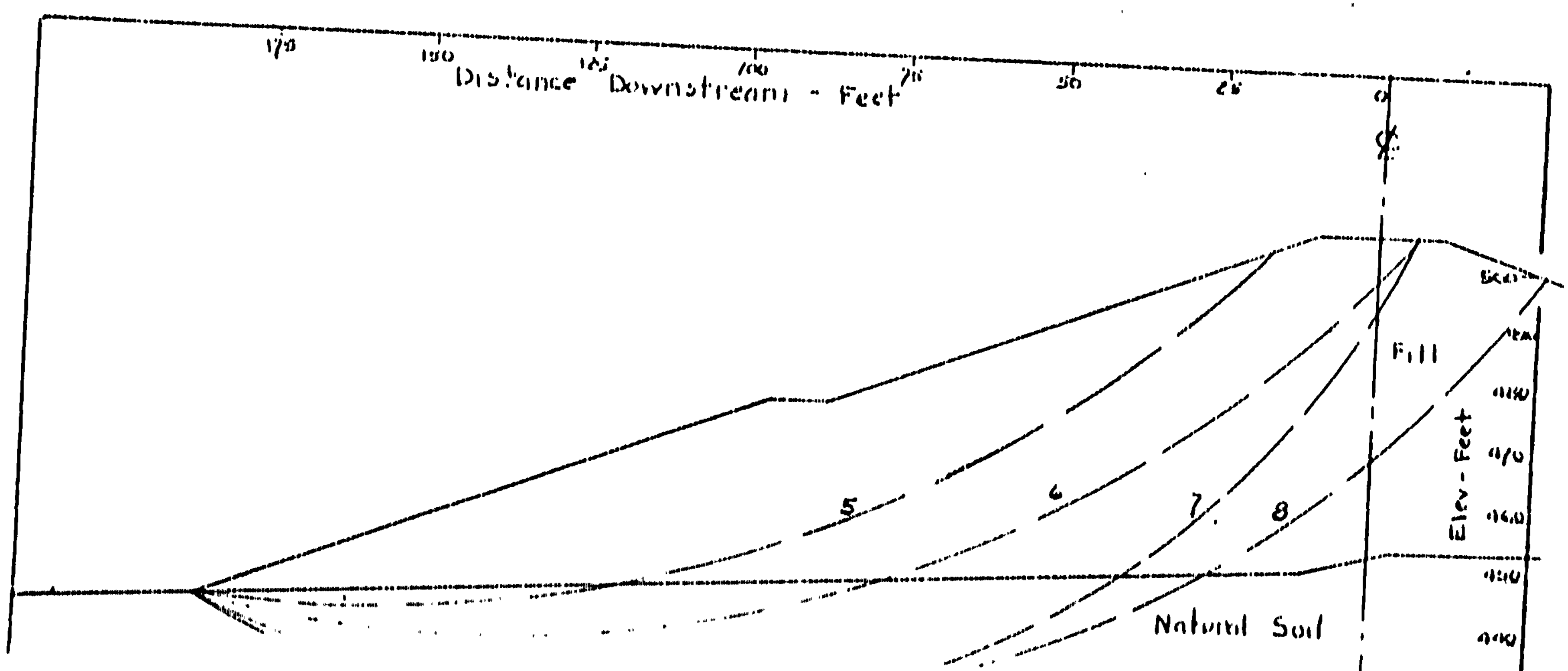
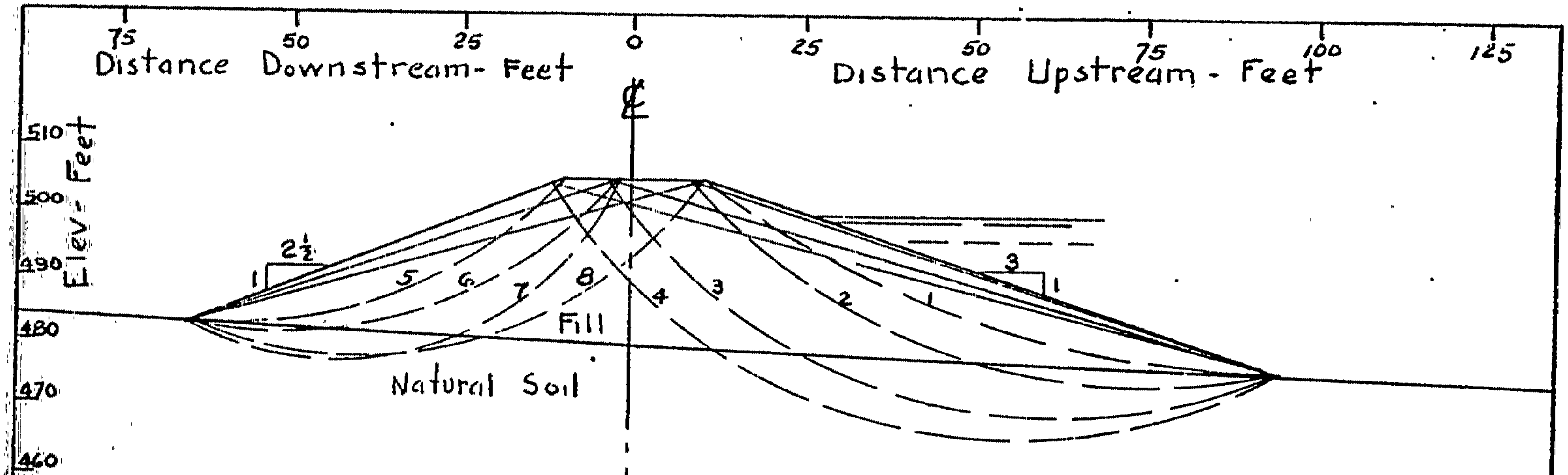
VALLEY SECTION - SECTION A-A

FIG. 25



Distance Downstream - Feet
Fill
Elev - Feet
Natural Soil
5
6
7
8



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HERALD TRIBUNE DAM
FISHKILL, NEW YORK

RIGHT ABUTMENT - SECTION B-B-

Arc	θ	β	Factor of Safety	
			During Construction	
5	56.4°	21.8°	2.10	
6	64.1°	19.0°	1.74	
7	97.0°	19.0°	1.70	
8	81.5°	16.0°	1.83	

Arc	θ	β	Factor of Safety		
			During Construction	Reservoir Full	Sudden Drawdown
1	36.5°	18.28°	3.28	5.32	2.83
2	64.0°	18.0°	2.08	3.01	1.59
3	82.5°	15.8°	1.97	2.68	1.41
4	90.0°	14.5°	2.02	2.65	1.39

FIG. 27.

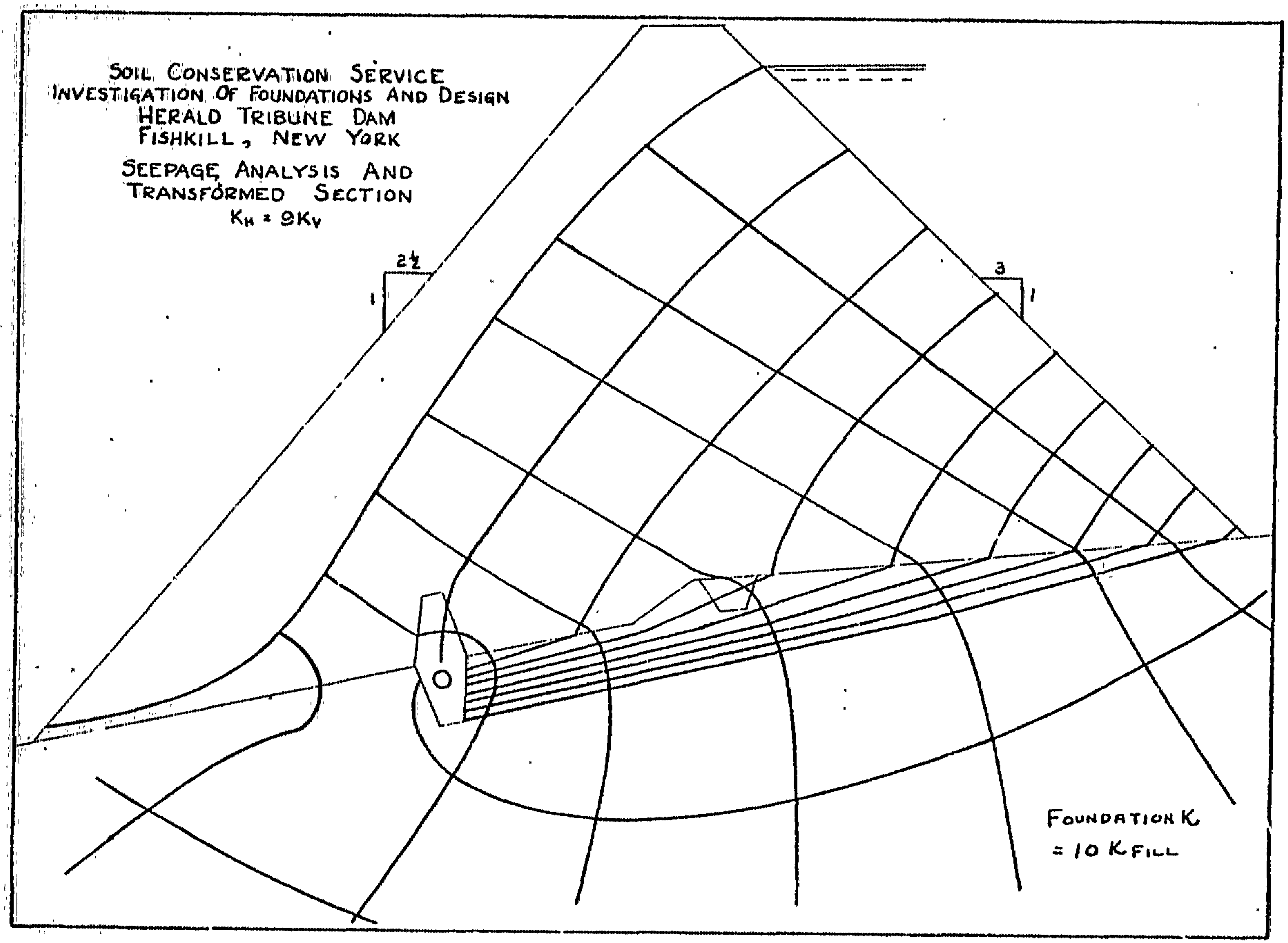
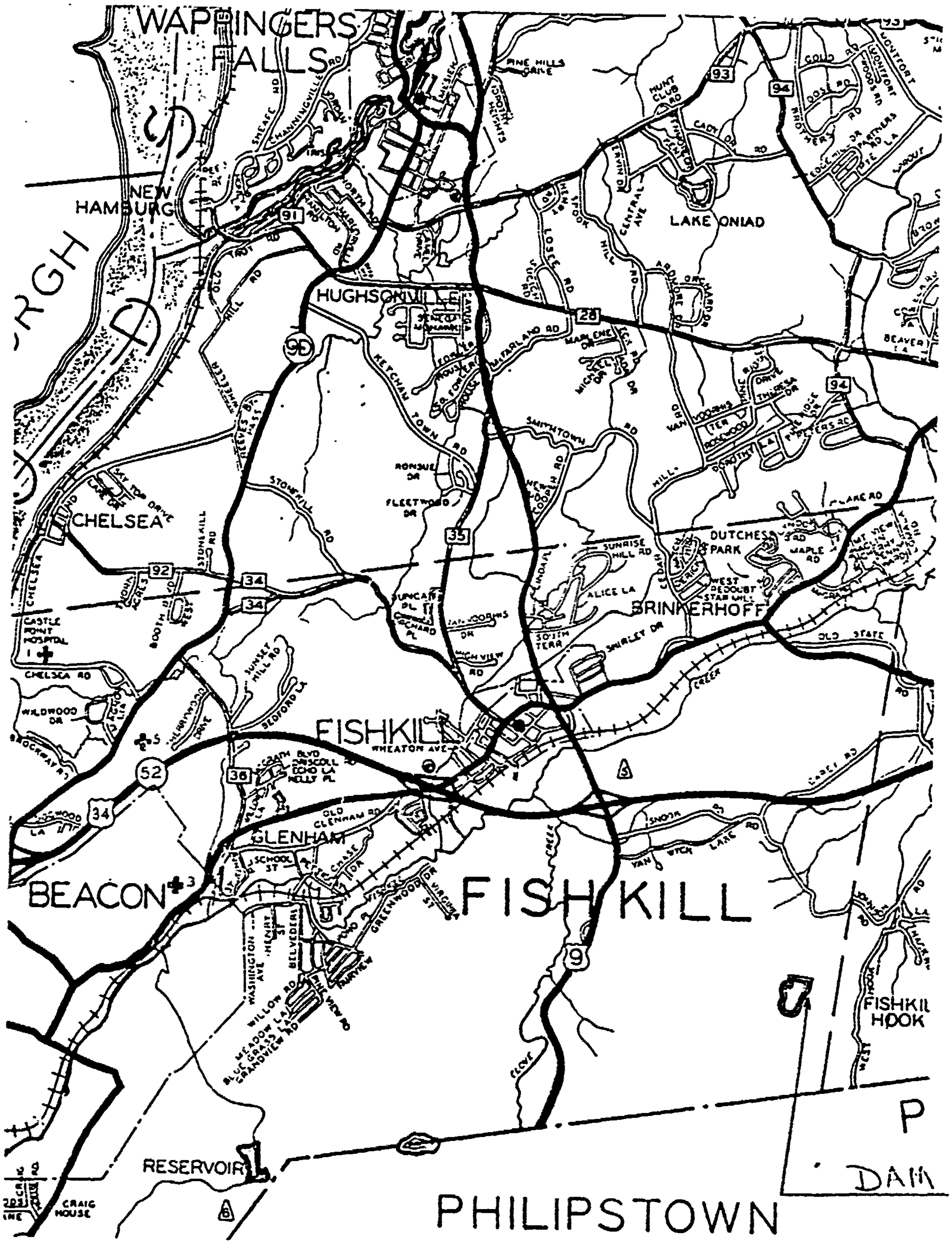

SOIL CONSERVATION SERVICE
INVESTIGATION OF FOUNDATIONS AND DESIGN
HERALD TRIBUNE DAM
FISHKILL, NEW YORK
SEEPAGE ANALYSIS AND
TRANSFORMED SECTION
$K_H = 9K_V$
2½
1
3
1
FOUNDATION K
= 10 K FILL

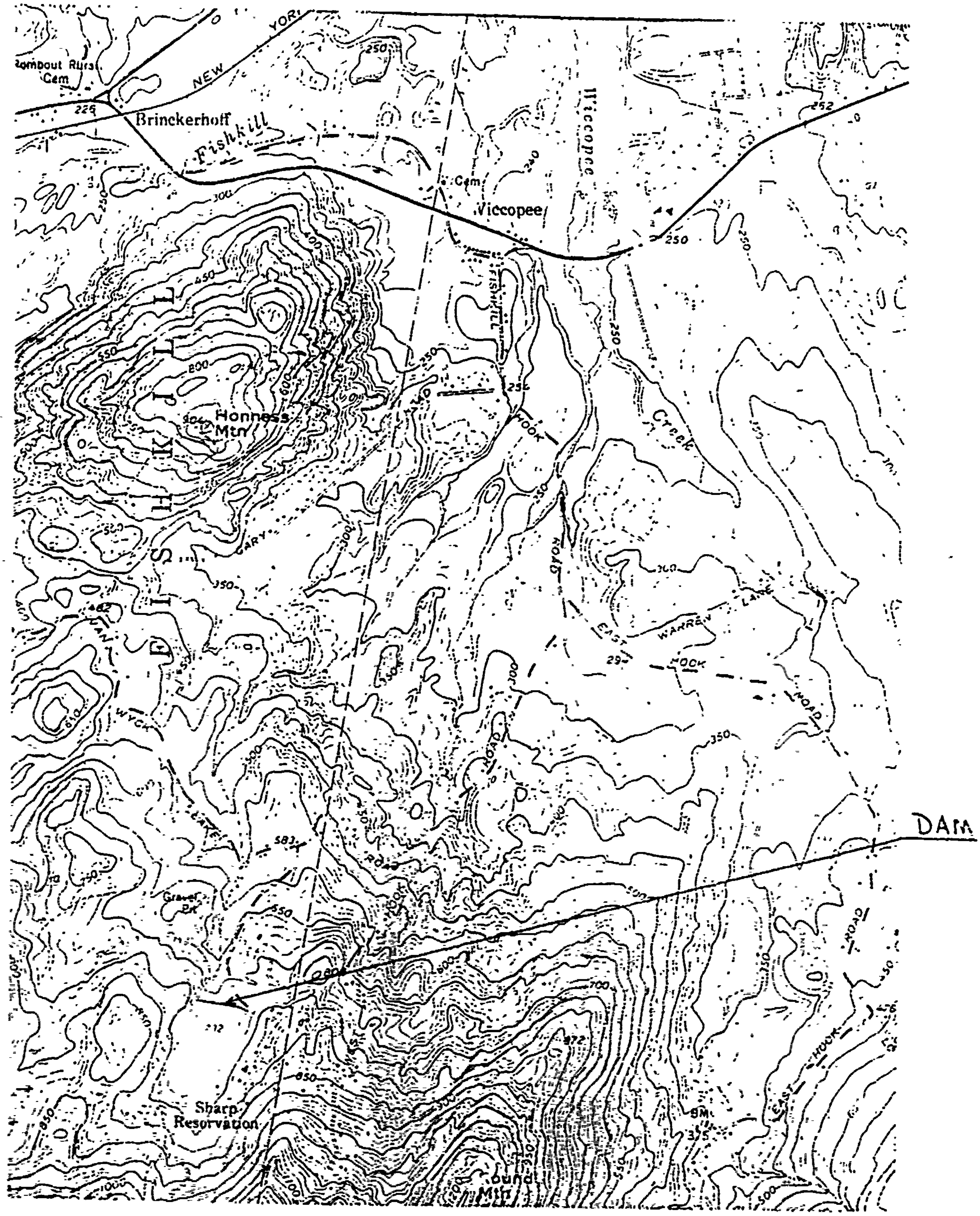
FIG. 28a

APPENDIX F

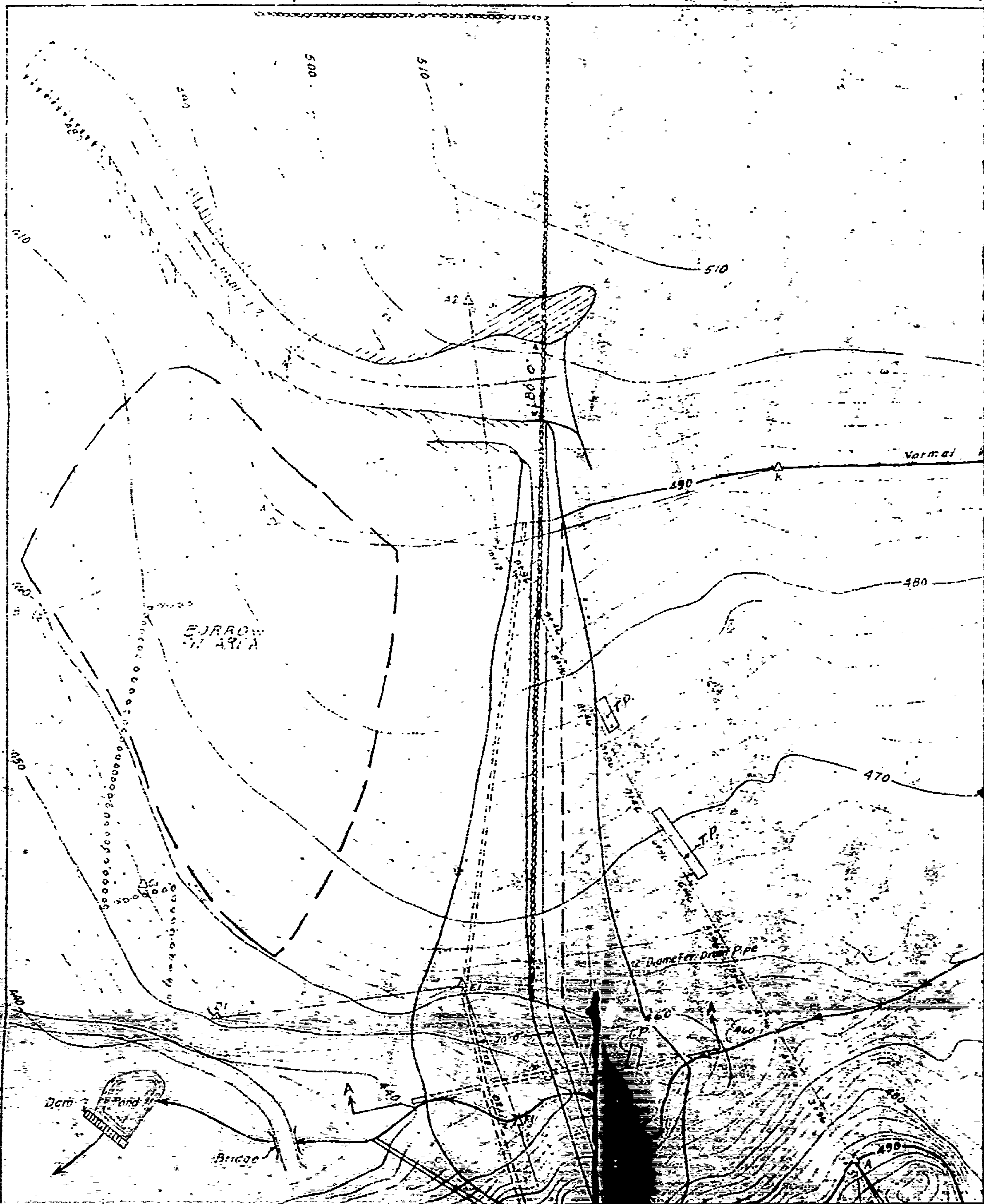
DRAWINGS



VICINITY MAP

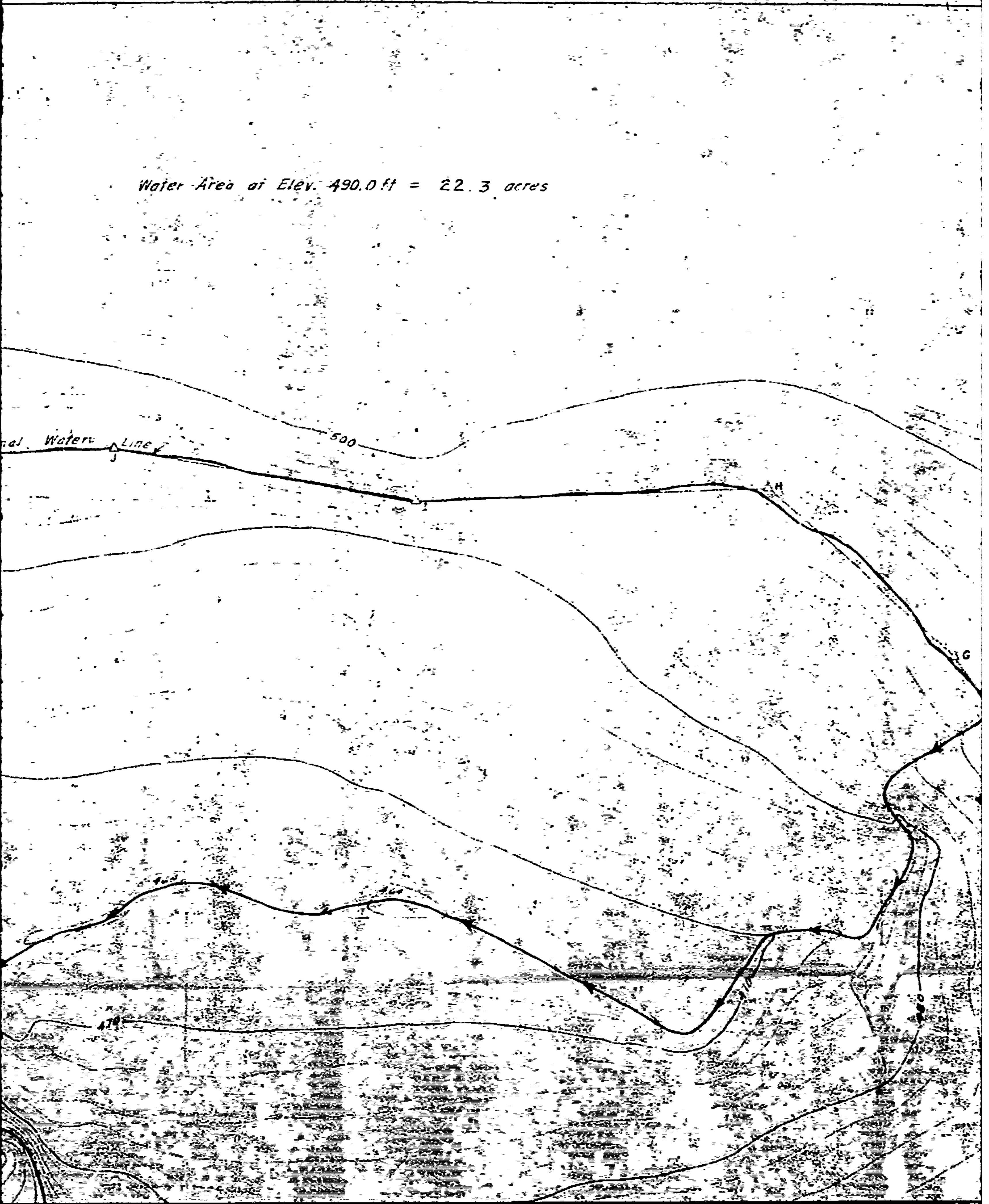


TOPOGRAPHIC MAP



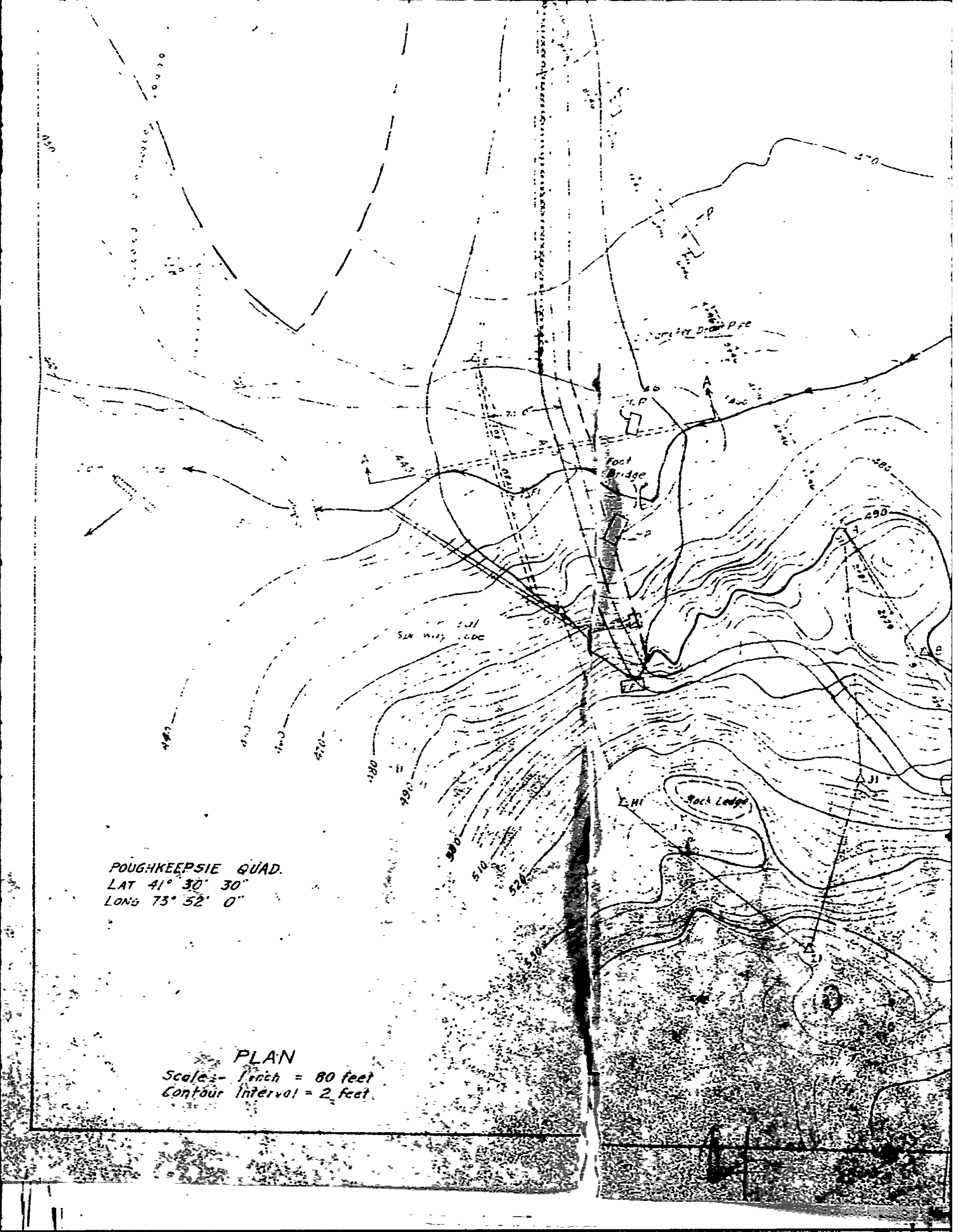
500
510
510
Normal
490
480
470
T.P.
T.P.
12" Diameter Drain Pipe
460
460
T.P.
440
Dam
Pond
Bridge
490
480
450
440

2

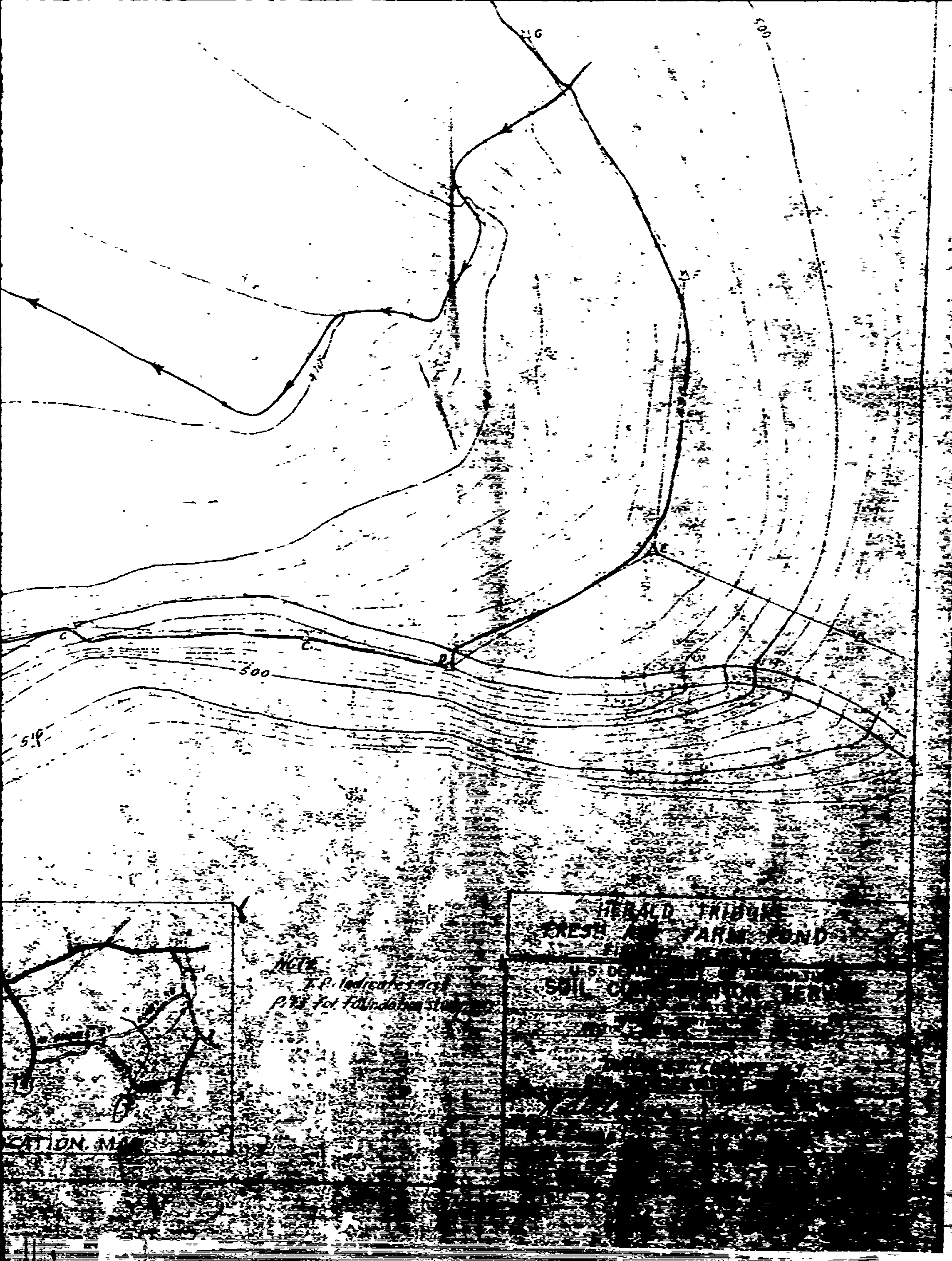


Water Area at Elev. 490.0 ft = 22.3 acres
al Water Line
J
500
H
G
470
470

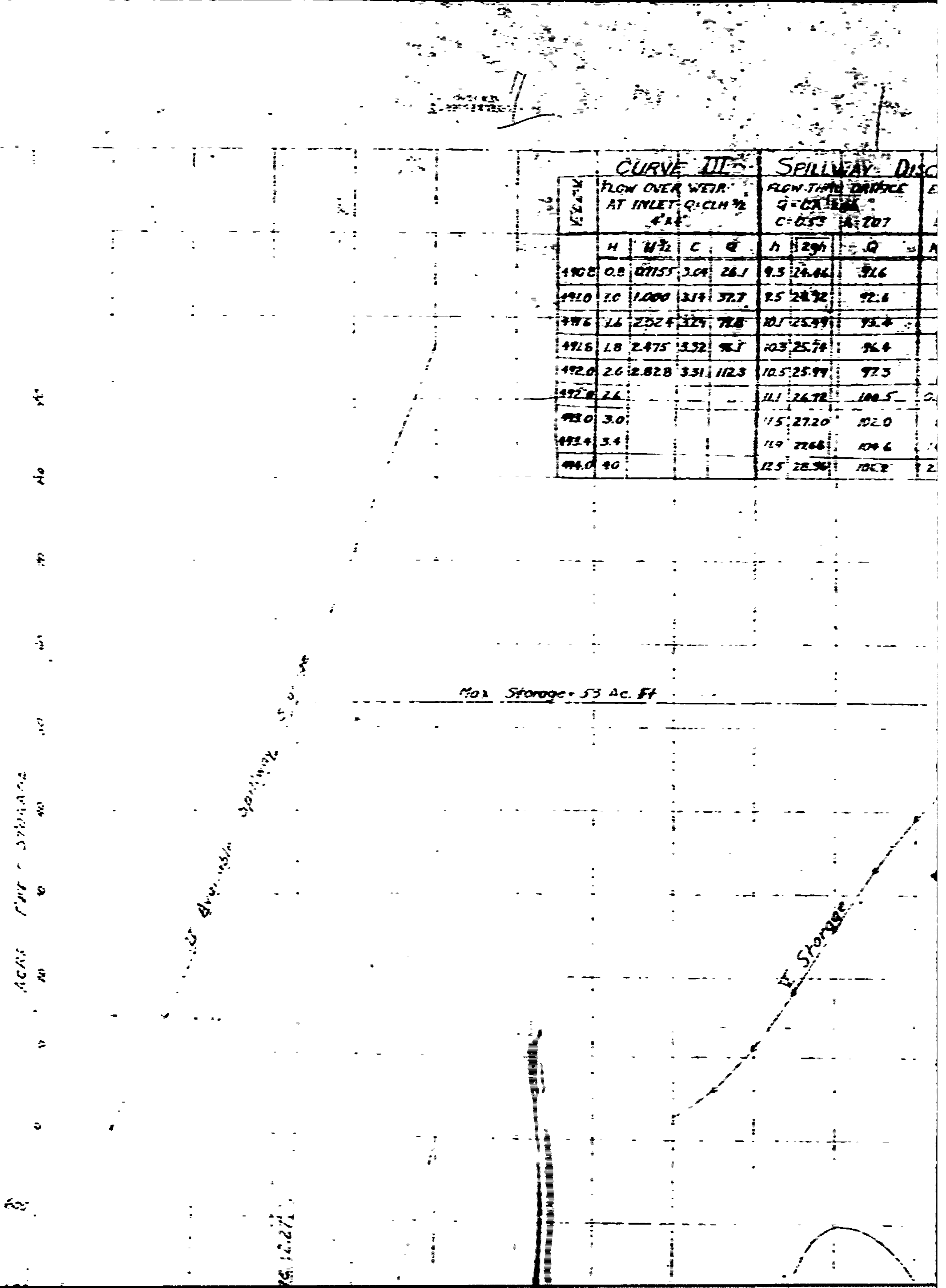
1 3


POUGHKEEPSIE QUAD.
LAT 41° 30' 30"
LONG 73° 52' 0"
PLAN
Scale:- 1 inch = 80 feet
Contour Interval = 2 feet
Foot Bridge
Rock Ledge
490
480
470
510
520
530


470
480
490
500
510
520
530
540
FISHKILL
LOCATION MAP
NOTE
T.P. Indicates Test
Pits for Foundation Study

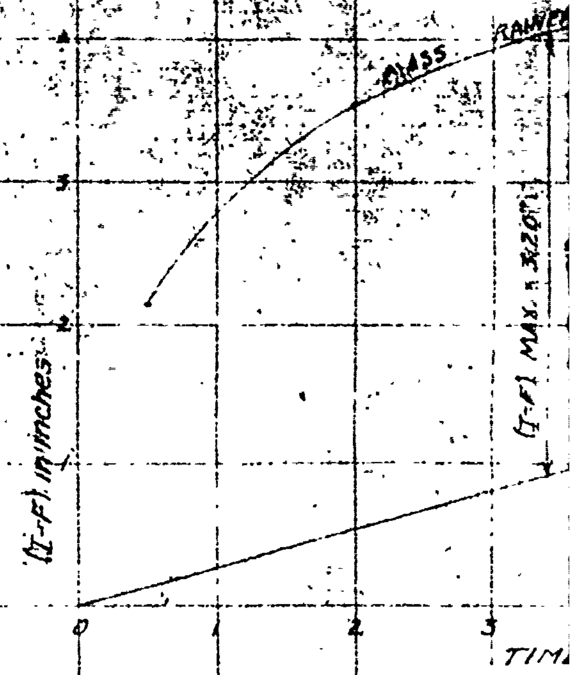


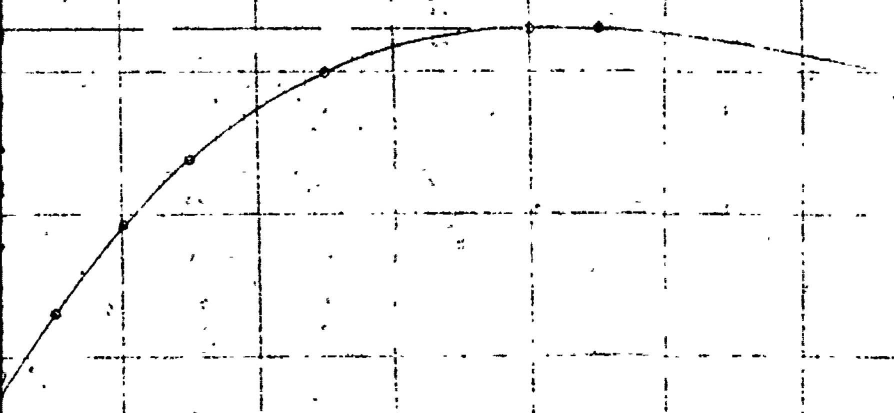
500
510
NOTE
T.P. indicates test
HERALD TRIBUNE
FARM POND
SOIL



ELEV.	CURVE III				SPILLWAY DISC		
	FLOW OVER WEIR AT INLET $Q = CLH^{3/2}$ 4'x4'				FLOW THRU ORIFICE $Q = CA\sqrt{2gh}$ C = 0.53 A = 7.07		
	H	$H^{3/2}$	C	Q	h	$\sqrt{2gh}$	Q
490.8	0.8	0.7155	3.04	26.1	9.3	24.46	91.6
491.0	1.0	1.000	3.14	37.7	9.5	24.72	92.6
491.6	1.6	2.024	3.24	78.6	10.1	25.49	93.4
491.8	1.8	2.475	3.32	95.1	10.3	25.74	96.4
492.0	2.0	2.828	3.31	112.3	10.5	25.99	97.3
492.6	2.6				11.1	26.72	100.5
493.0	3.0				11.5	27.20	102.0
493.4	3.4				11.9	27.68	104.6
494.0	4.0				12.5	28.36	106.2

...Y DISCHARGE				
...RIFICE 20.7	EMERGENCY SPILLWAY $Q = CLH^{3/2}$ L=80-0"		C=2.63	
Q	H	$H^{3/2}$	Q	ΣQ
91.6				
92.6				
93.4				
96.4				
97.3				
100.5	0.6	0.4648	97.8	198.3
102.0	1.0	1.000	210.4	312.4
104.6	[illegible]	1.6565	348.0	452.6
106.2	2.0	2.828	596.0	702.2





$R = \frac{(I-F)\,Max}{12} \times$ ...

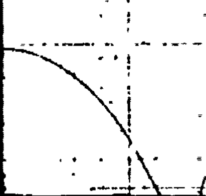
$V = 0.000842\ R$ ...

$W = \frac{Q}{60} = \frac{596}{60}$ ...

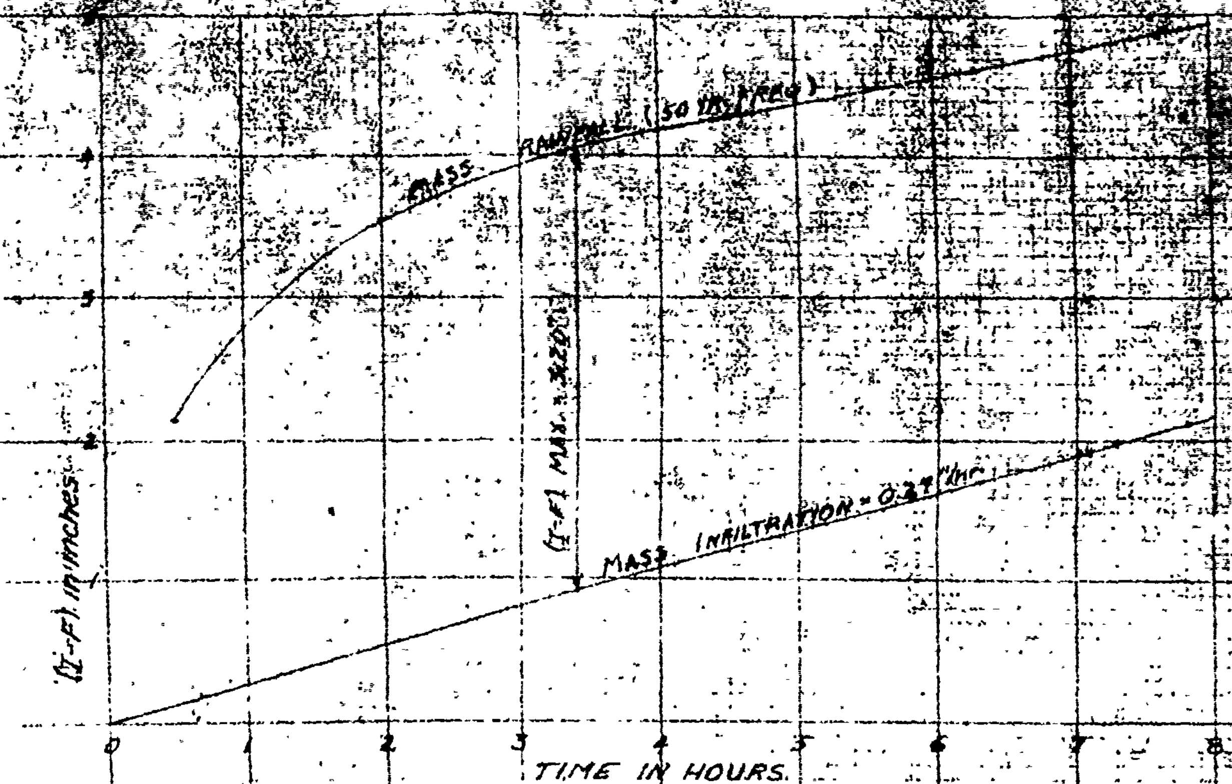
$K = 726\ \frac{V}{W} = 72$ ...

INFL...

POIN...
a
b
c
d
e
f
g
h
i
j
k
l
m
n
o
p
q
r



Check =



$R = \frac{(I-F)\,Max}{12} \times A = \frac{3.2}{12} \times 280 = 74.7\ Ac.Ft.$

$V = 0.000842\ R = 0.000842 \times 74.7 = 0.0629\ Ac.Ft.$

$W = \frac{Q}{60} = \frac{596}{60} = 9.93\ cfs$

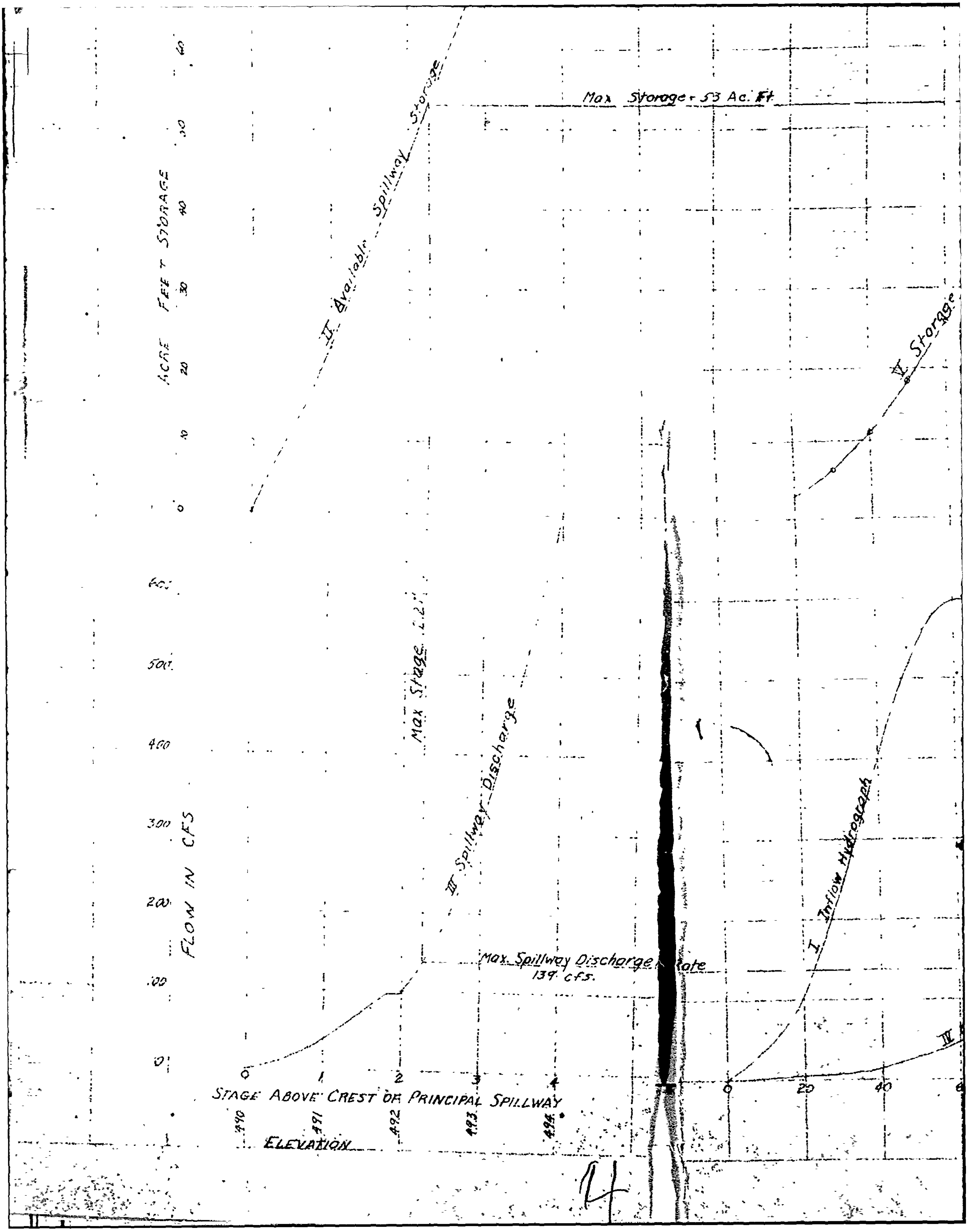
$K = 726\ \frac{V}{W} = 726\ \frac{0.0629}{9.93} = 4.6\ min.$

INFLOW HYDROGRAPH - CURVE I.

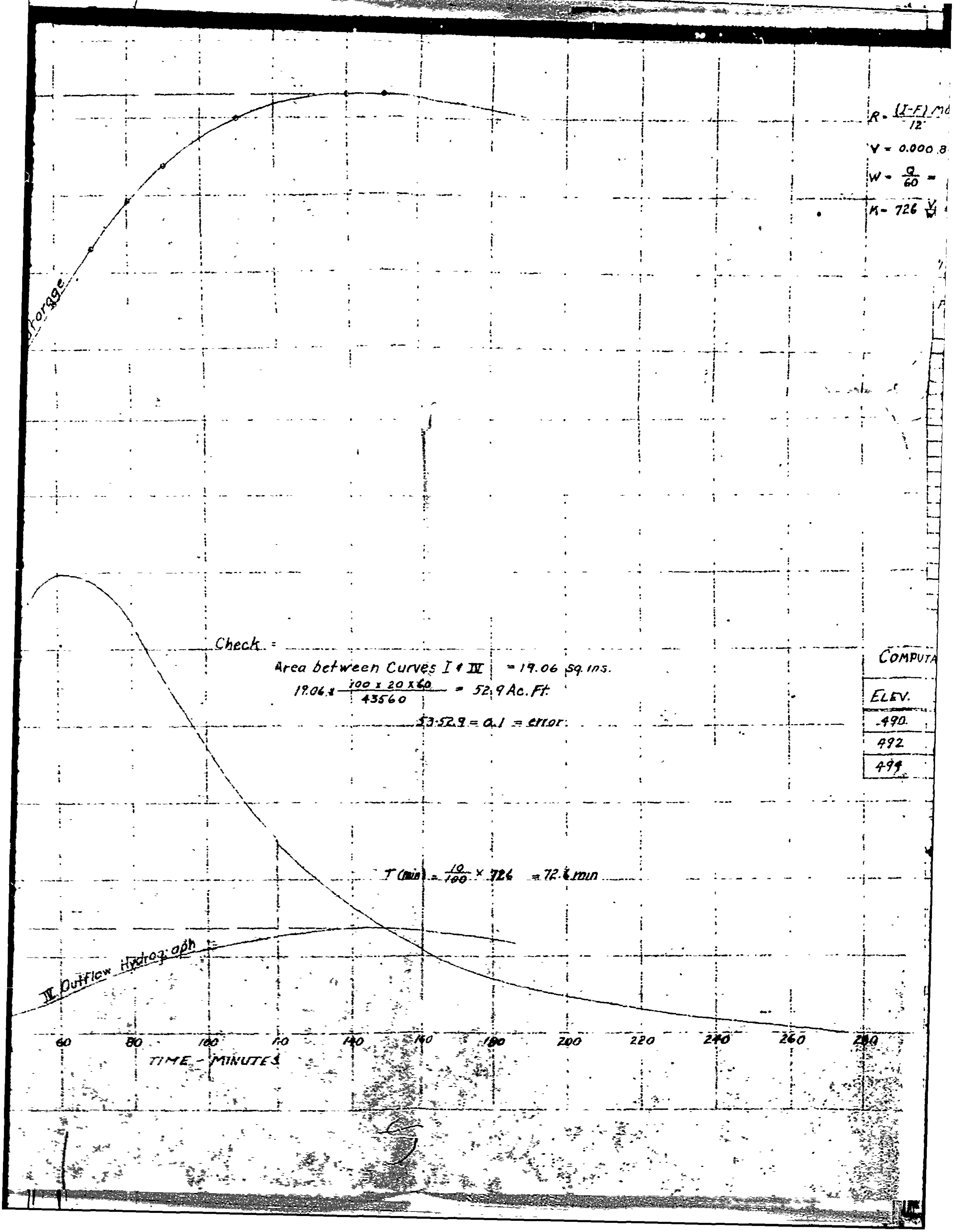
POINT	COORDINATES		COORDINATES	
	t	q	TIME IN MIN. = 4.61 t	FLOW IN CFS = 0.9939 q
a	0	0	0	0
b	2	3.5	9.22	[illegible]
c	4	8.6	18.44	[illegible]
d	6	20.7	[illegible]	[illegible]
e	8	35.0	36.88	[illegible]
f	10	49.7	46.10	[illegible]
g	12	[illegible]	55.32	[illegible]
h	14	60.0	64.54	[illegible]
i	16	59.2	73.76	[illegible]
j	18	51.0	92.98	[illegible]
k	20	43.8	[illegible]	[illegible]
l	24	30.0	110.64	[illegible]
m	28	20.4	129.08	[illegible]
n	32	14.0	147.52	[illegible]
o	36	9.6	165.96	[illegible]
p	40	6.6	[illegible]	[illegible]
q	50	2.8	[illegible]	[illegible]
r	60	0	[illegible]	0

COMPUTATIONS FOR AVAILABLE SPILLWAY STORAGE
CURVE II

19.06 sq. ins.



Max Storage = 53 Ac. Ft
II Available Spillway Storage
ACRE FEET STORAGE
0
10
20
30
40
50
60
V Storage
Max Stage 2.25'
III Spillway Discharge
FLOW IN CFS
100
200
300
400
500
600
Max. Spillway Discharge Rate 139 cfs.
I Inflow Hydrograph
IV
0
1
2
3
4
STAGE ABOVE CREST OF PRINCIPAL SPILLWAY
490
491
492
493
494
ELEVATION
0
20
40
4



Storage
Check =
Area between Curves I & IV = 19.06 sq. ins.
19.06 x (100 x 20 x 60)/43560 = 52.9 Ac. Ft.
53-52.9 = 0.1 = error.
T (min) = 10/100 x 726 = 72.6 min
IV Outflow Hydrograph
60
80
100
120
140
160
180
200
220
240
260
280
TIME - MINUTES
R = (I-F)
12
V = 0.000 8
W = Q/60 =
K = 726 V/W
COMPUTA
ELEV.
490
492
494

$R = \frac{(I-F)\,Max}{12} \times A = \frac{3.2}{12} \times 280 = 74.7$ Ac. Ft.

$V = 0.000842\,R = 0.000842 \times 74.7 = 0.0629$ Ac. Ft.

$W = \frac{Q}{60} = \frac{596}{60} = 9.93$ cfs

$K = 726\,\frac{V}{W} = 726\,\frac{0.0629}{9.93} = 4.6$ min.

INFLOW HYDROGRAPH - CURVE I

POINT	COORDINATES		COORDINATES	
	t	q	TIME IN MIN. = 4.61 t	FLOW IN CFS = 9.93 q
a	0	0	0	0
b	2	3.5	9.22	[illegible]
c	4	8.6	18.44	[illegible]
d	6	20.7	[illegible]	[illegible]
e	8	35.0	[illegible]	[illegible]
f	10	49.7	46.10	[illegible]
g	12	58.5	55.32	[illegible]
h	14	60.0	64.54	[illegible]
i	16	57.7	73.76	[illegible]
j	18	51.0	82.98	[illegible]
k	20	43.8	92.20	[illegible]
l	24	30.0	110.64	[illegible]
m	28	20.4	129.08	[illegible]
n	32	14.0	[illegible]	[illegible]
o	36	9.6	165.96	[illegible]
p	40	[illegible]	[illegible]	[illegible]
q	50	[illegible]	[illegible]	[illegible]
r	60	0	[illegible]	0

COMPUTATIONS FOR AVAILABLE SPILLWAY STORAGE CURVE II

ELEV.	STAGE	AREA FLOODED IN ACRES	AVAILABLE SPILLWAY STORAGE - ACRE FT.
490	0	22.30	0
492	2	24.25	[illegible]
494	4	25.82	[illegible]

= 19.06 sq. ins.

Ac. Ft.

= error

= 72.6 min

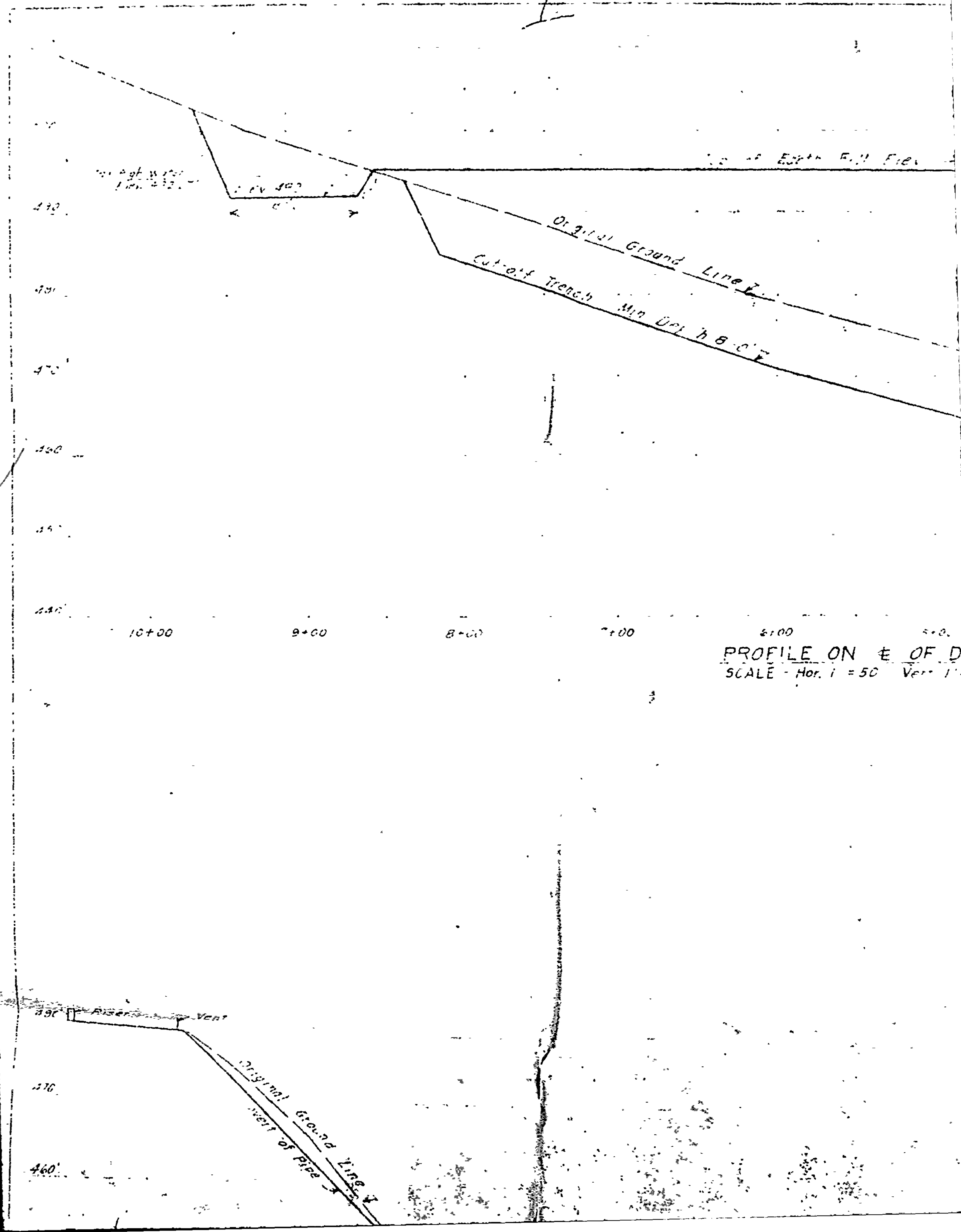
200 220 240 260 280

HERALD TRIBUNE
FRESH AIR FARM POND
FISHKILL, NEW YORK

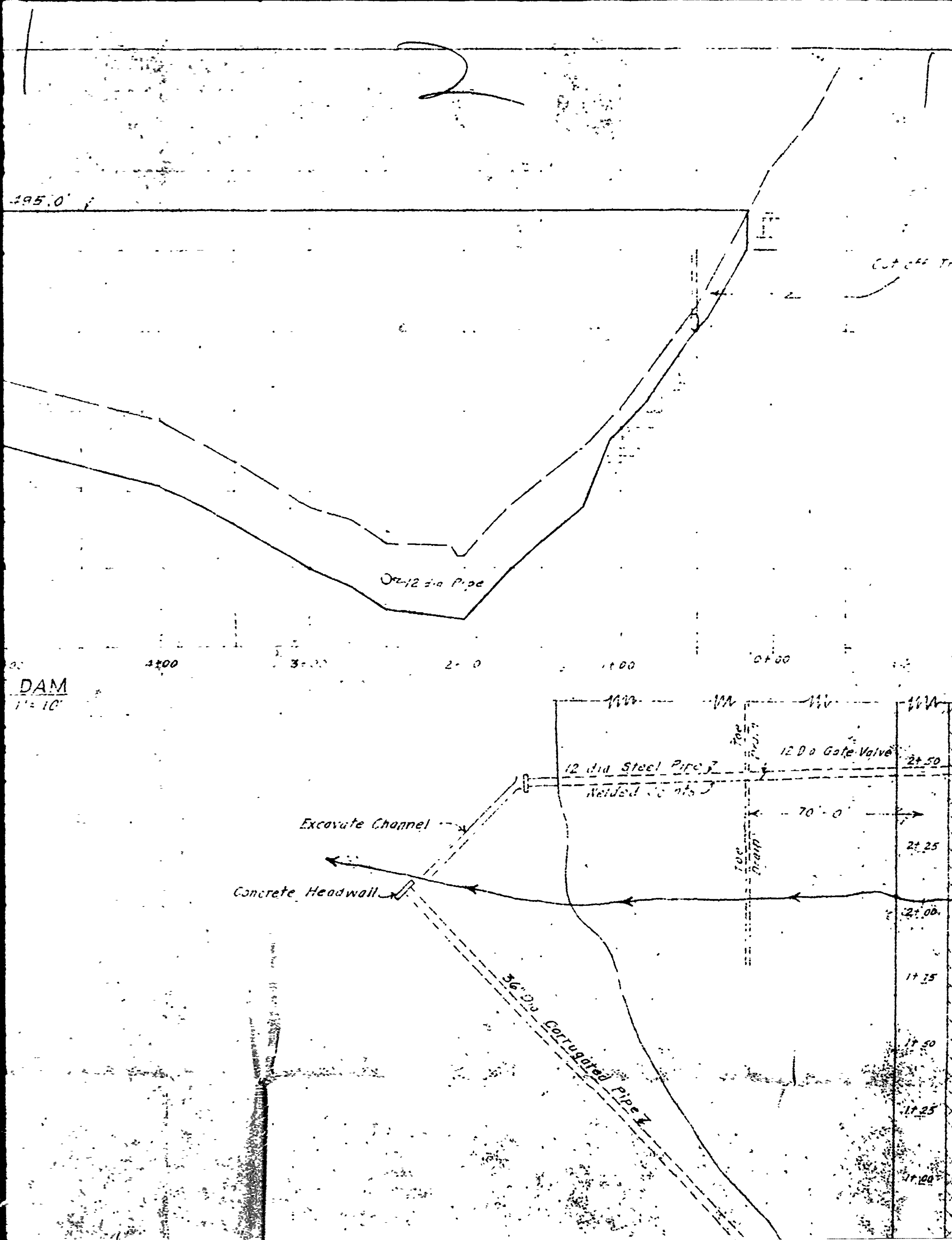
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
H. H. BENNETT, CHIEF
REGION I - NORTHEASTERN REGION
AUSTIN L. PATRICK - REGIONAL DIRECTOR
ASSISTING
DUTCHESS COUNTY, N.Y.
SOIL CONSERVATION DISTRICT

ENGINEERING APPROVAL	CARTOGRAPHIC APPROVAL
DESIGNED BY G. W. GRUBB	DRAWN BY J. [illegible]
CHECKED BY H. G. [illegible]	DRAWING NUMBER P-1245
DATE APRIL, 1951	SHEET 2 OF 6 SHEETS

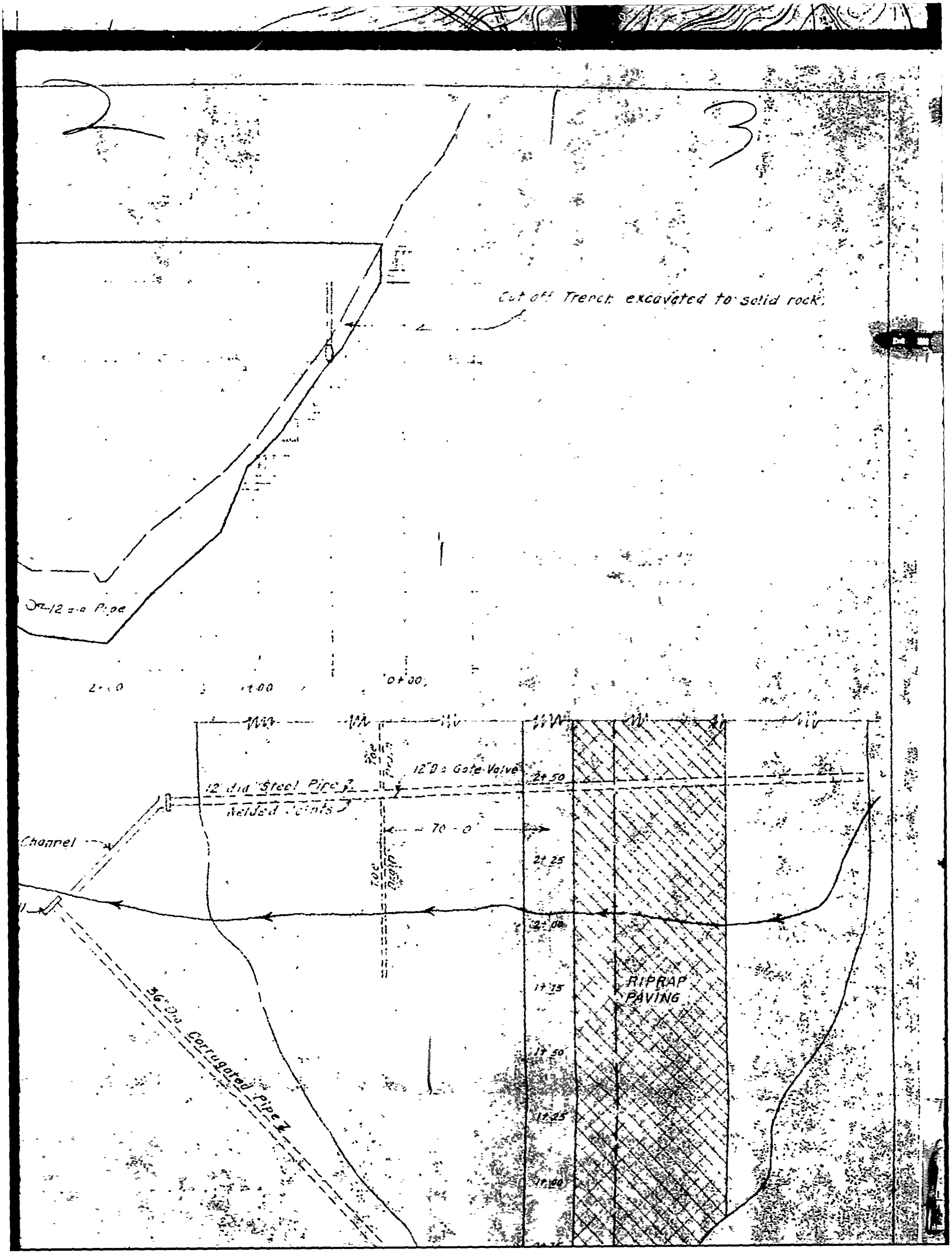
6



Top of Earth Fill Elev.
Original Ground Line
Cut-off Trench Min. Depth 8.0'
10+00
9+00
8+00
7+00
6+00
PROFILE ON ℄ OF D
SCALE - Hor. 1" = 50' Vert. 1"=
Riser
Vent
Original Ground Line
Invert of Pipe
490'
460'

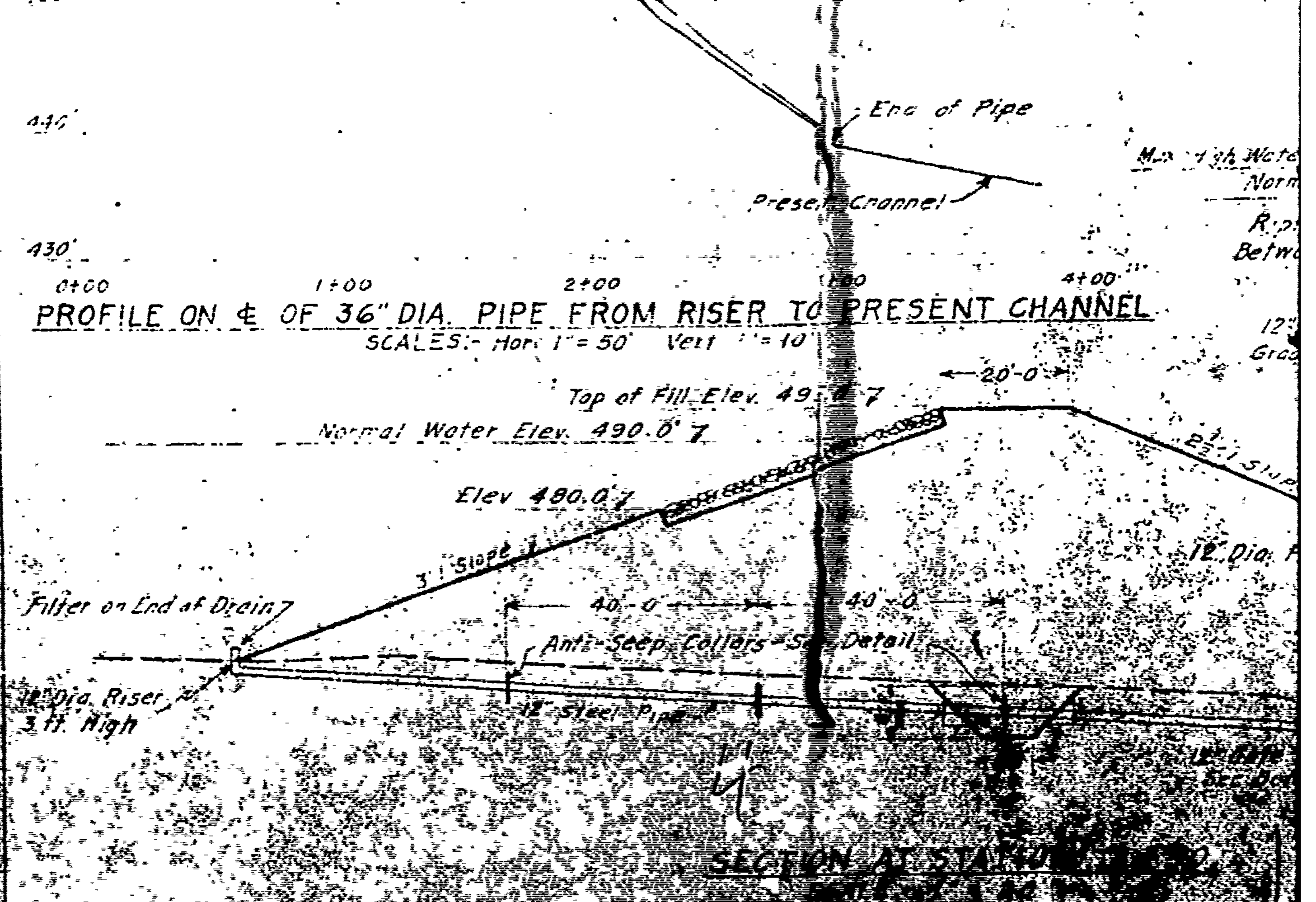


2
495.0'
Cut off Tr
12 dia Pipe
4+00
2+0
+00
0+00
DAM
1"=10'
12 D o Gate Valve
12 dia Steel Pipe
Welded
70'-0"
Toe Drain
Excavate Channel
Concrete Headwall
36" Dia Corrugated Pipe
2+50
2+25
2+00
1+75
1+50
1+25
1+00

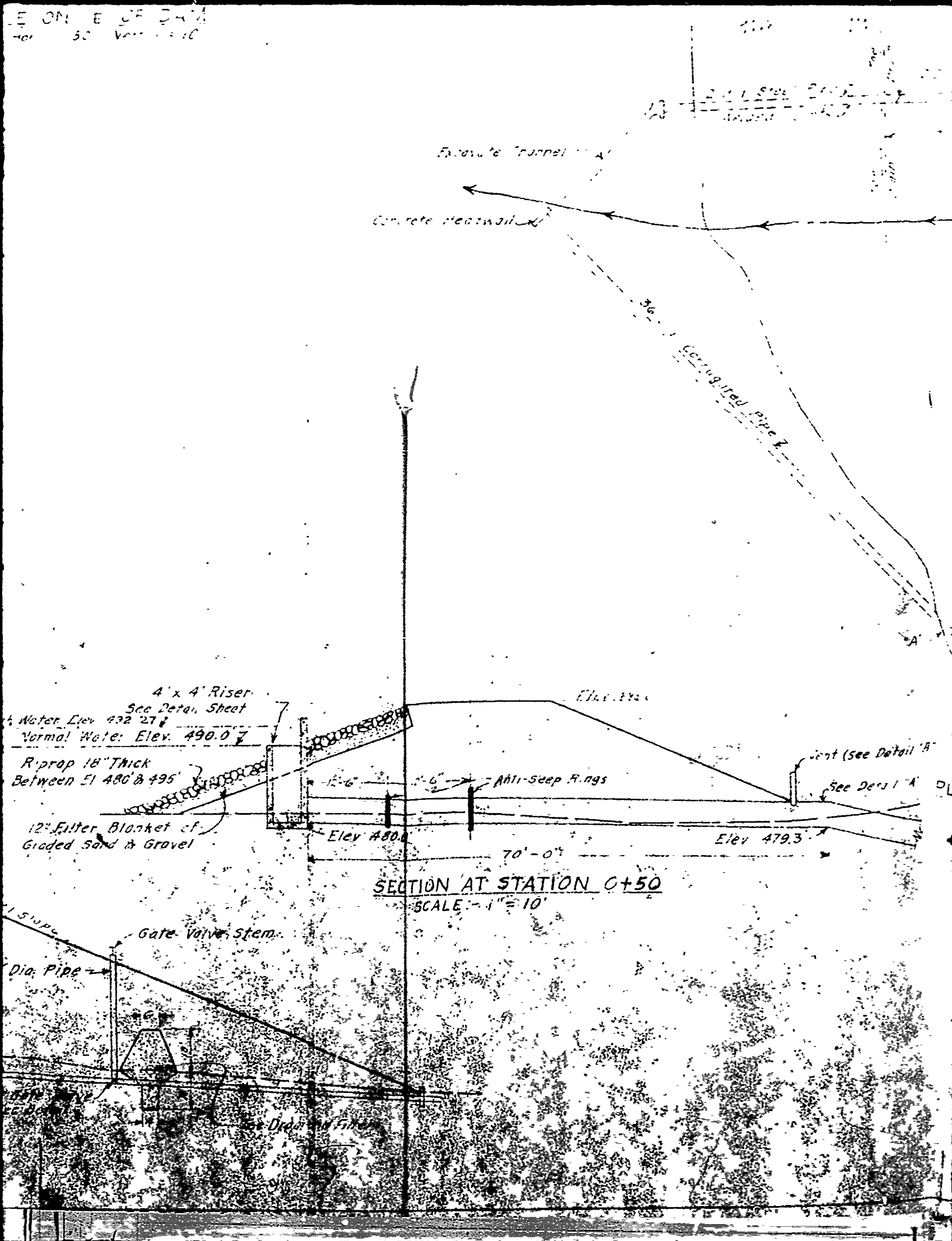


2
1
3
Cut off Trench excavated to solid rock.
12" dia Pipe
2+00
1+00
0+00
12" Dia Gate Valve
12" dia Steel Pipe
Welded Joints
70'-0"
Channel
Toe Proj.
2+50
2+25
2+00
1+75
1+50
1+25
1+00
RIPRAP PAVING
36" Dia Corrugated Pipe

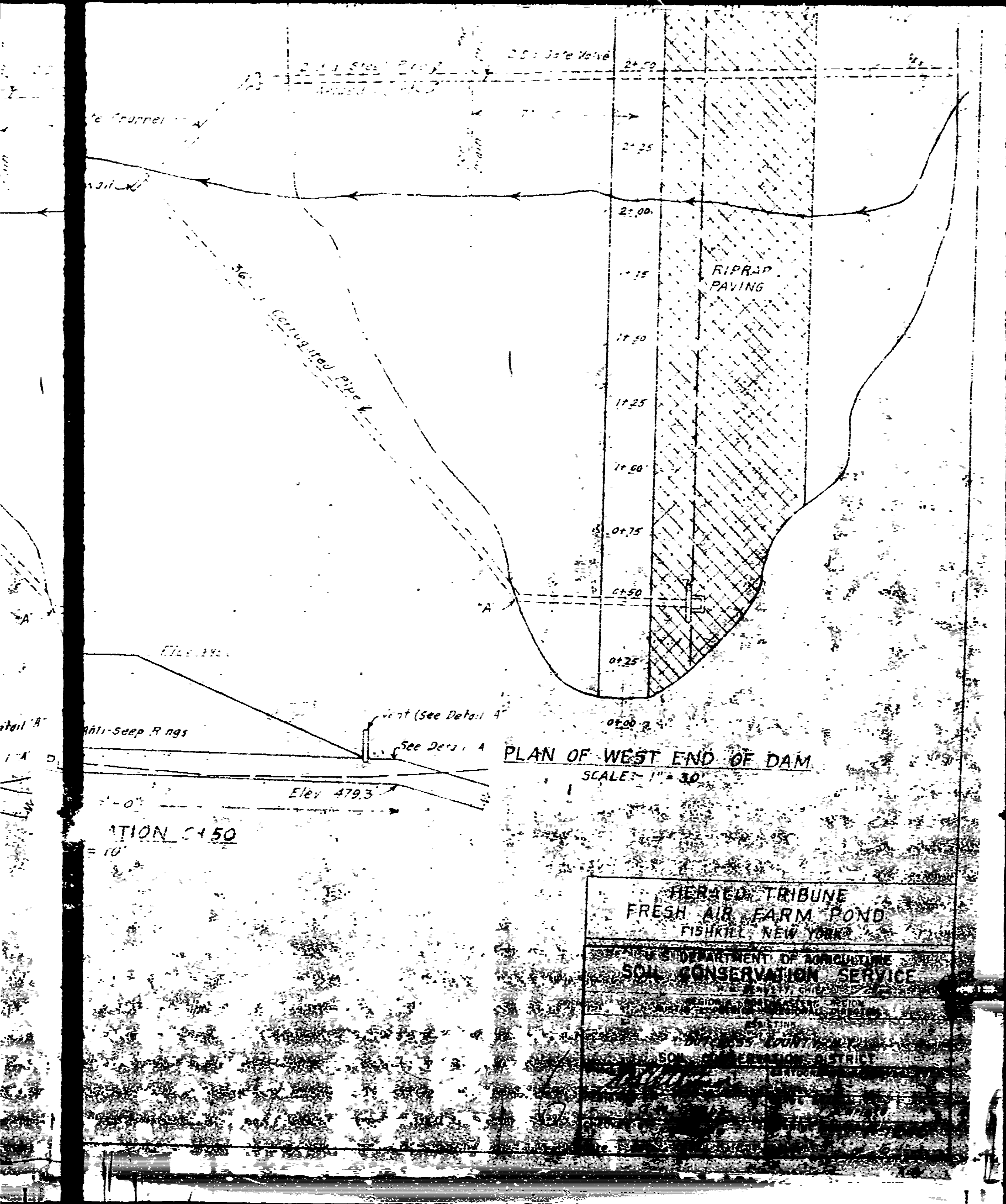
PROFILE ON ℄ OF 36" DIA. PIPE FROM RISER TO PRESENT CHANNEL
SCALES:- Hor. 1" = 50' Vert. 1" = 10'



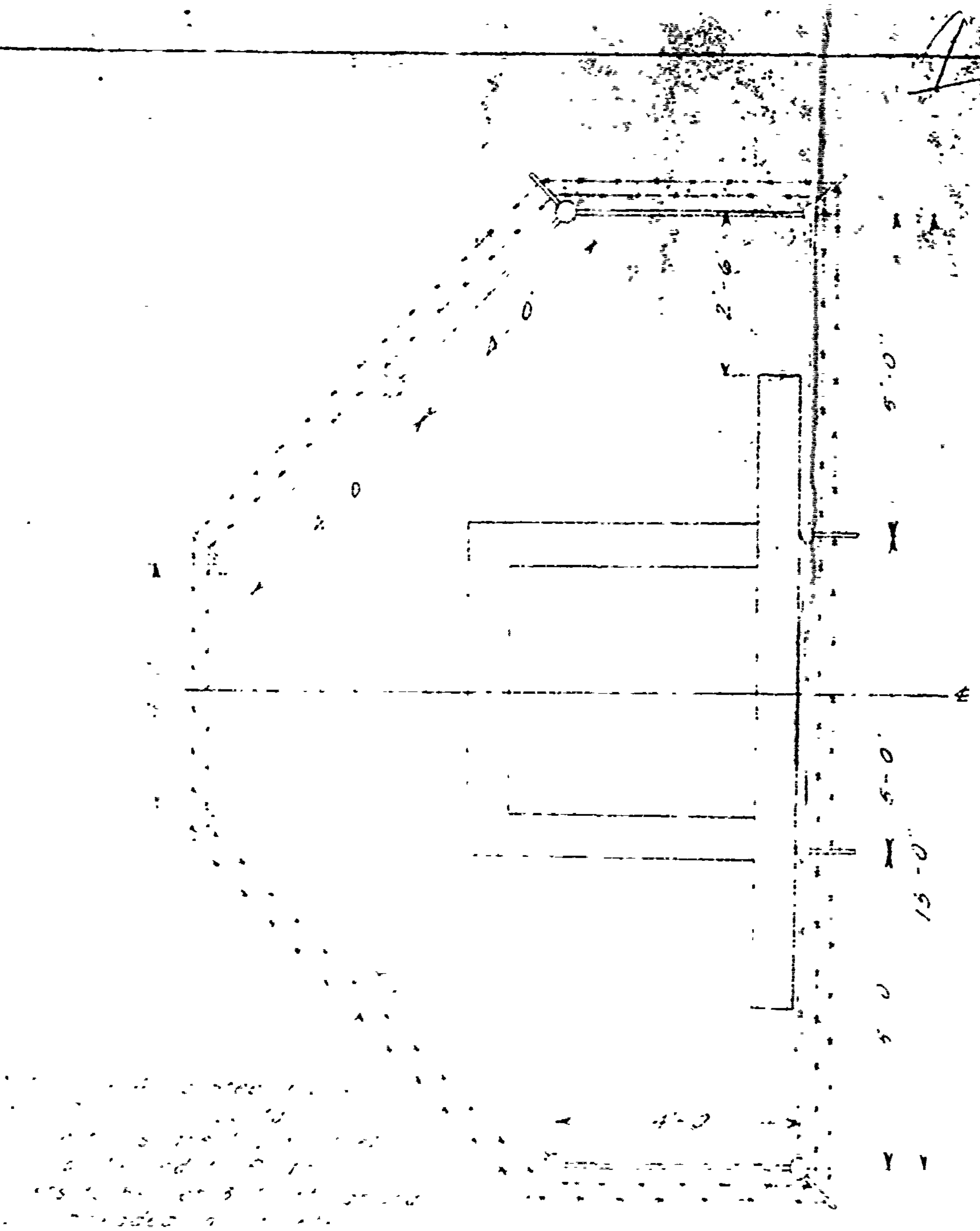
SECTION AT STATION



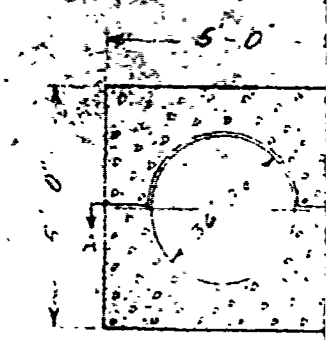
Excavate Channel
Concrete Headwall
36" Corrugated Pipe
4' x 4' Riser
See Detail Sheet
Normal Water Elev. 490.0
Riprap 18" Thick
Between El 480' & 495'
12" Filter Blanket of
Graded Sand & Gravel
Anti-Seep Rings
See Detail "A"
Elev 480.0
Elev 479.3
70'-0"
SECTION AT STATION 0+50
SCALE - 1" = 10'
Gate Valve Stem
Dia. Pipe



2+50
2+25
2+00
RIPRAP PAVING
1+50
1+25
1+00
0+75
0+50
0+25
0+00
Corrugated Pipe
Anti-Seep Rings
See Detail A
Elev 479.3
PLAN OF WEST END OF DAM
SCALE: 1" = 30'
HERALD TRIBUNE
FRESH AIR FARM POND
FISHKILL, NEW YORK
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
DUTCHESS COUNTY, N.Y.
SOIL CONSERVATION DISTRICT



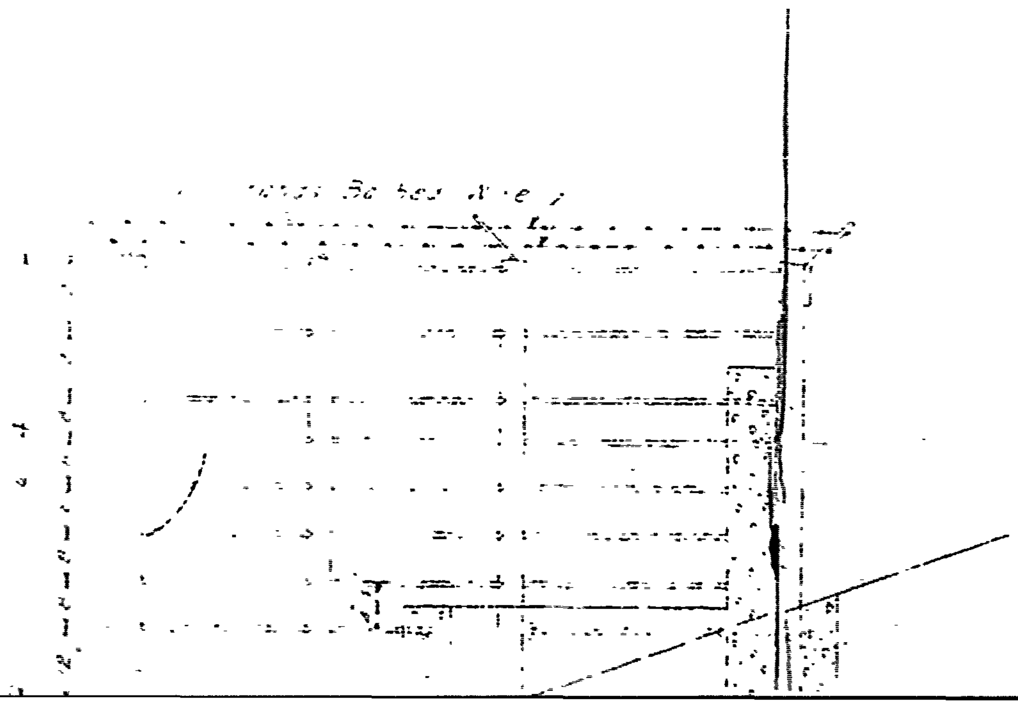
PLAN VIEW

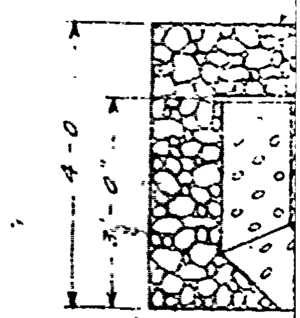


END VIEW

Concrete Rey

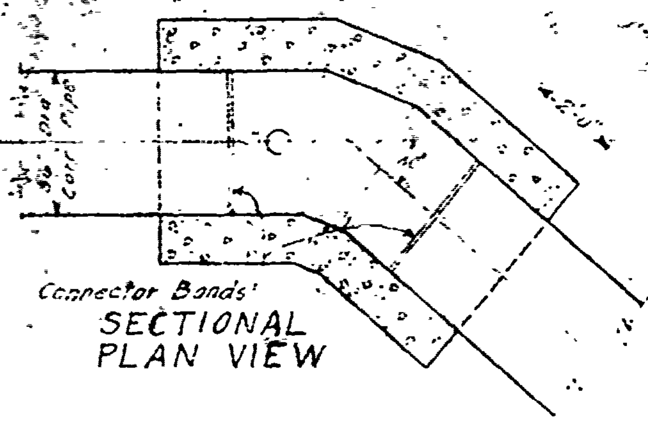
DETAILS CI





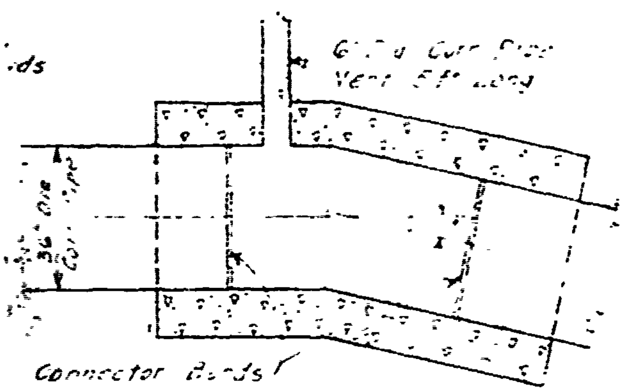
DETAIL OF FILTE
END OF 12" STE
Scale -

VIEW



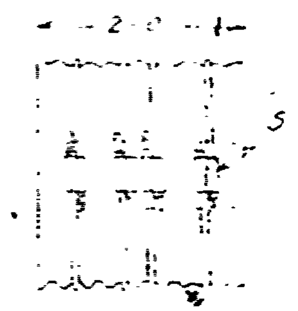
SECTIONAL PLAN VIEW

DETAILS OF ANTI-SEEP
SCALE

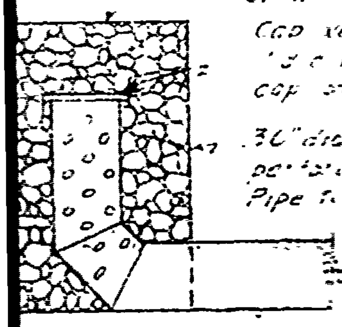


SECTION VIEW

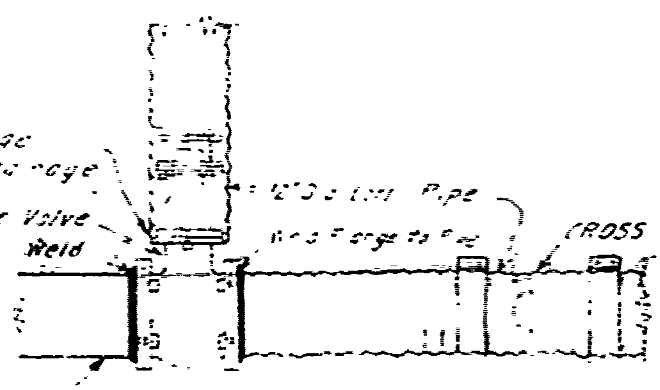
...S OF PIPE & VENT AT POINT "A"



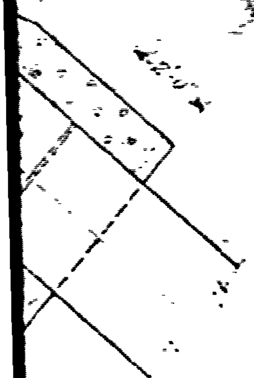
WATER-TIGHT BAN...
36" P...

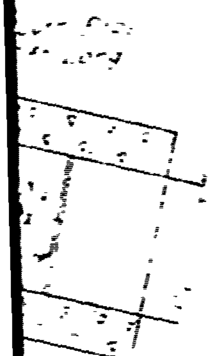


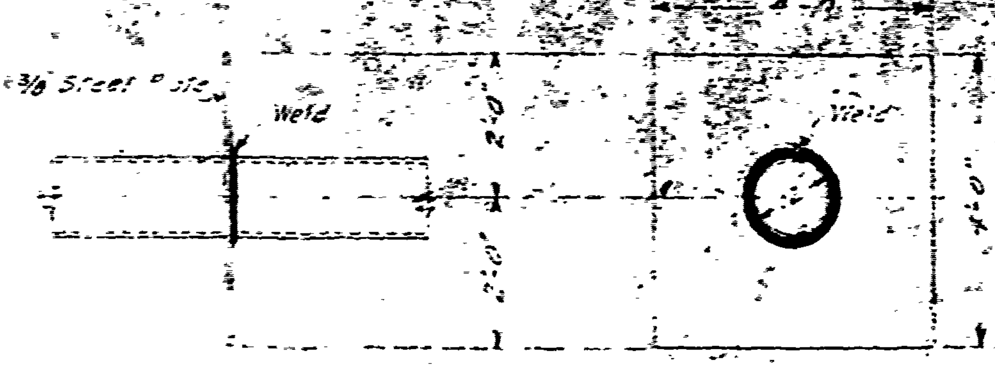
FILTER ON UPSTREAM
2" STEEL DRAIN PIPE



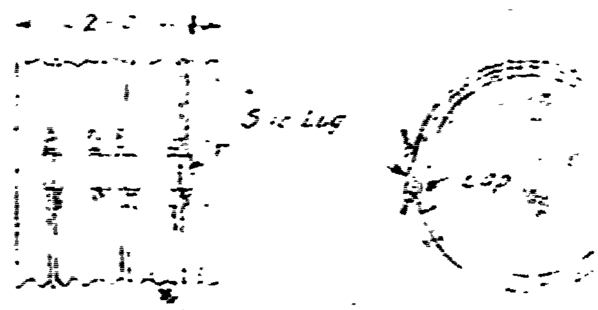
DETAILS OF GATE VALVE & CON...
DO NOT SCALE



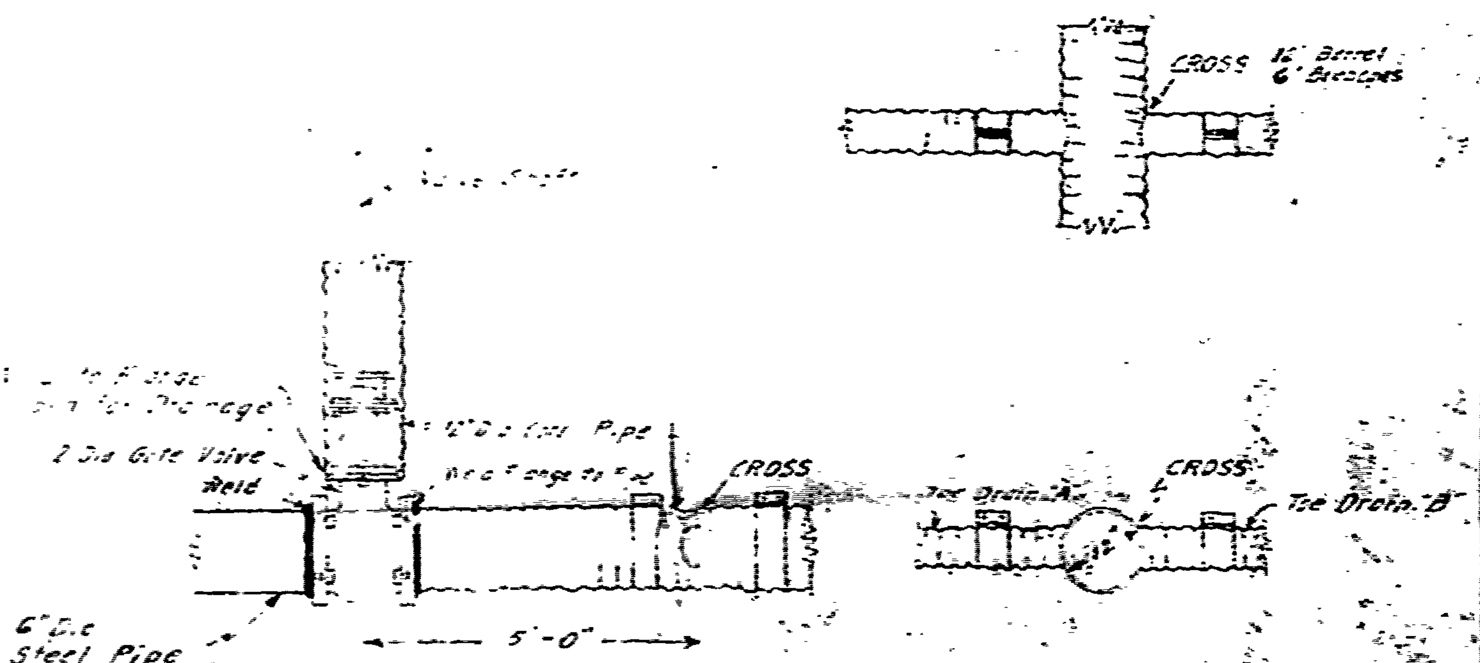




DETAILS OF ANTI-SEEP COLLAR FOR 12" DRAIN
SCALE - 1" = 2'



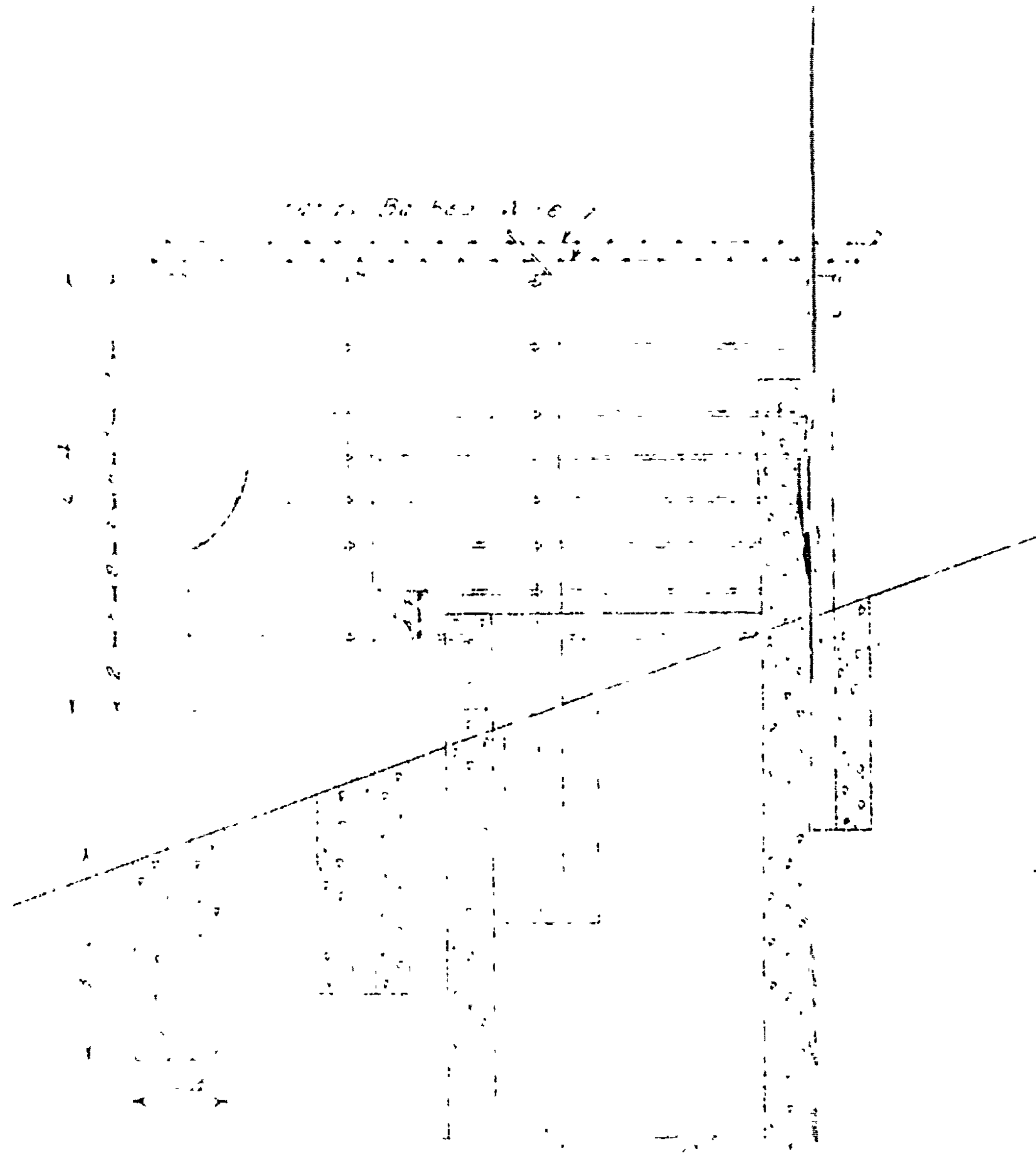
WATER TIGHT BAND TO BE USED ON
36" PIPE
DO NOT SCALE



DETAILS OF GATE VALVE & CONNECTIONS FOR TOE DRAINS
DO NOT SCALE

Check =

PLAN VIEW



SECTION ALONG ℄

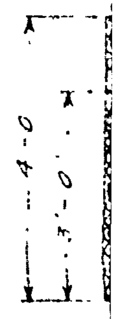
DETAILS OF GUARD RAIL AROUND INLET STRUCTURE
SCALE 1" = 2'

MATERIAL FOR GUARD RAIL AROUND INLET

Steel Pipe, 4 in	115 lin ft
Steel Pipe, 1 in	328 lin ft
Angle Post Tops	10 each
Barbed Wire	74 lin ft
Concrete	2 cu yds

4

DET



DETAIL
END OF

HYDROLOGIC DATA

WATERSHED
WOODLAND ... SLOPE
WOODLAND ... SLOPE
POND, ROADS, ETC. ...
TOTAL WAT
LENGTH OF WATERSHED
TIME OF CONCENTRATIO
WEIGHTED RUNOFF COEF
INTENSITY OF RAINFALL
RUNOFF = Q FOR 50 YR

SUMMARY OF PERT

WATER SURFACE AREA
NORMAL STORAGE CAPA

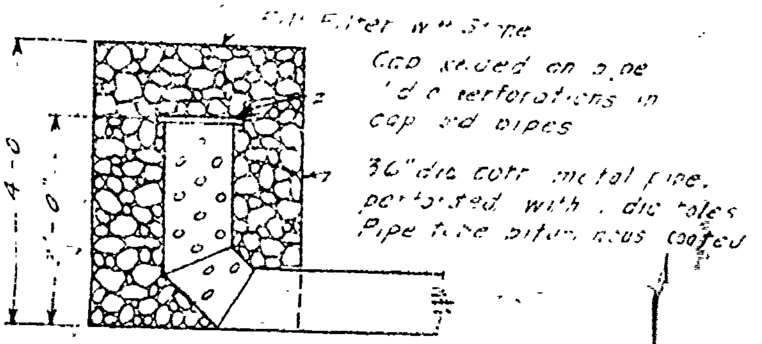
ELEV NORMAL WATER
" PRINCIPAL SPILLW
" EMERGENCY SPIL
" MAX FLOOD CR
" TOP OF EARTH FI
FREEBOARD
QUANTITY OF EARTH F
QUANTITY OF EARTH F
EXCAVATION FOR CORE
EXCAVATION FOR PRIN
EXCAVATION FOR DRAIN

19.06 sq. ins.

COMPUTATIONS FOR AVAILABLE SPILLWAY STORAGE CURVE

DETAILS OF PIPE & VENT AT POINT "A"

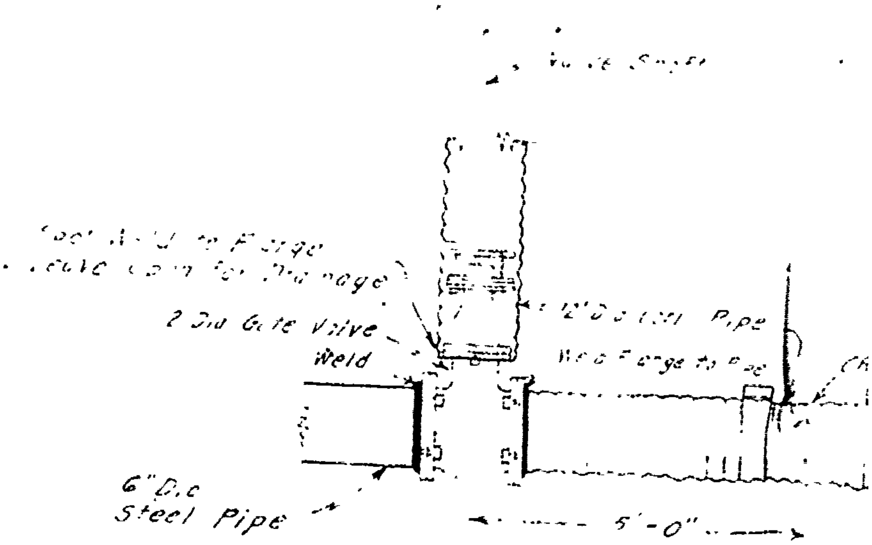
DO NOT SCALE



TAIL OF FILTER ON UPSTREAM

D OF 12" STEEL DRAIN PIPE

Scale - 1" = 2'



DETAILS OF GATE VALVE &

DO NOT SCAL

ATA

SLOPE 30%-60% ... 113 ACRES

SLOPE 0% 30% ... 37 "

... 30 "

WATERSHED ... 280 ACRES

RSHED ... 4885 LIN FT.

RATION 268 MIN

COEFFICIENT C ... 0.416

FALL I ... 5.12 IN/HR

YR. FREQ ... 596 C.F.S.

RTINENT INFORMATION

AREA ... 22 ACRES

CAPACITY ... 295 AC FT

" ... 12,851,94 CU FT

" ... 96,138,78 GALS

TER SURFACE ... 490 FT

PILLWAY CREST ... 490 FT

SPILLWAY CREST ... 492 FT

CREST ... 497.7 FT

H FILL (SETTLED) ... 49 FT

... 2.7 FT

H FILL ... 72,27 CU. YDS

H FILL IN CORE ... 6,54 CU. YDS.

CORE TRENCH ... 5,70 CU. YDS

PRINCIPAL SPILLWAY ... 30 CU. YDS

AIN & TOE DRAINS ... 2,0 CU. YDS

MATERIALS ESTIMATE

CORR METAL PIPE, 12 GA DOUBLE RIVETED, BITUMINOUS COATED, ASPHALT PAVED INVERT

36" DIA. WITH WATERTIGHT BANDS ... 200 LIN FT

36" DIA BEND - 3 SECTION - FABRICATED ... 1 EA

CORR METAL PIPE, BITUMINOUS COATED, 16 GA

6" DIA - PRINCIPAL SPILLWAY VENT ... 6 LIN FT.

2" DIA - GATE VALVE SHAFT - DRAIN ... 10 LIN FT

CROSS - 12" DIA BARREL - 6" DIA BRANCHES ... 1 EA

CORR METAL PIPE, 16 GA, PERFORATED BITUMINOUS COATED

6" DIA. - TOE DRAINS ... 600 LIN FT

STEEL PIPE, 12" DIA, 12 GA ... 95 LIN FT

STEEL PLATES, 4' x 4' x 3/8" ... 3 EA.

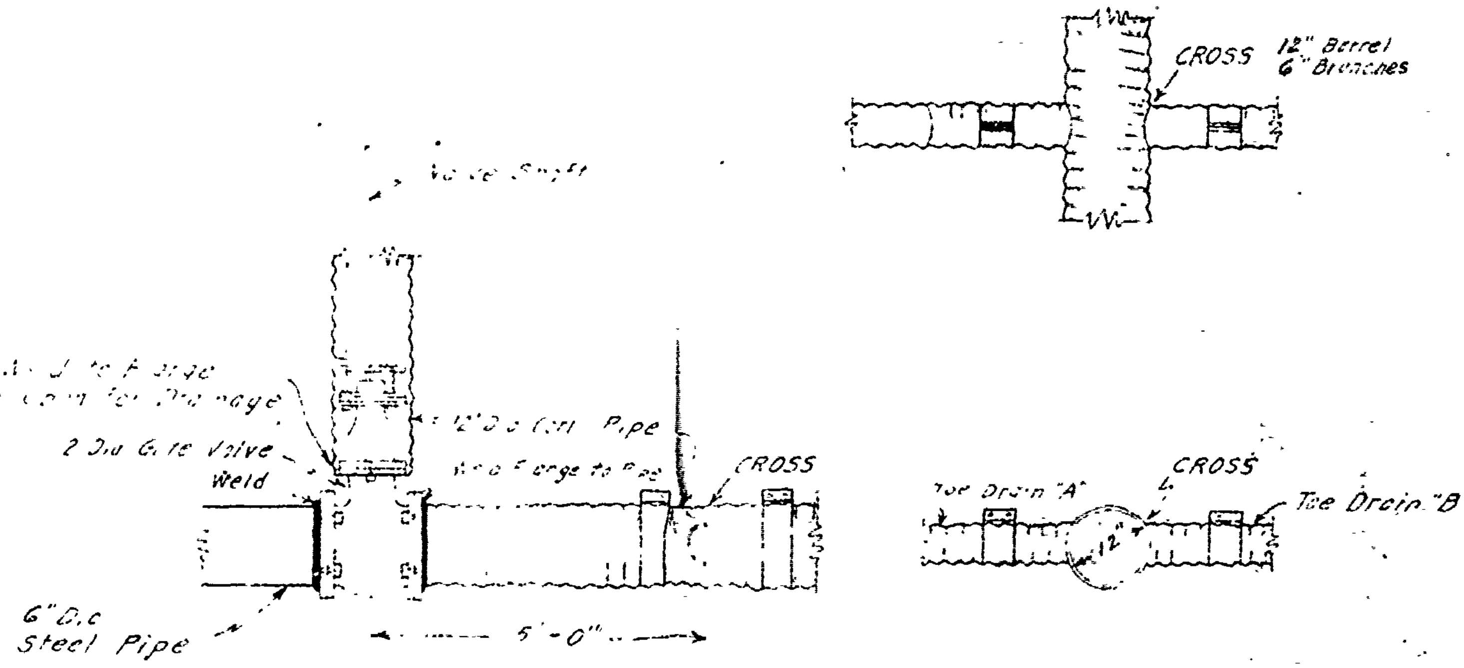
GATE VALVE, 12" DIA W/EXTENDED ROD ... 1 EA

CONCRETE ... 14.6 CU. YDS

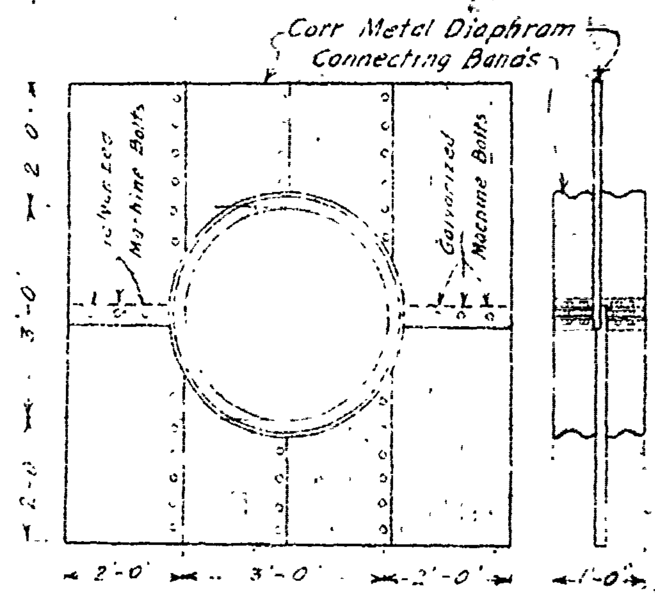
REINFORCING STEEL ... 672 LBS

ANTI-SEEP RINGS - CORR METAL 14 GA (FABRICATED) 2 EA

RIPRAP WITH FILTER BLANKET ... 1745 SQ. YDS.



DETAILS OF GATE VALVE & CONNECTIONS FOR TOE DRAINS
DO NOT SCALE



ANTI-SEEP RING
2 REQUIRED

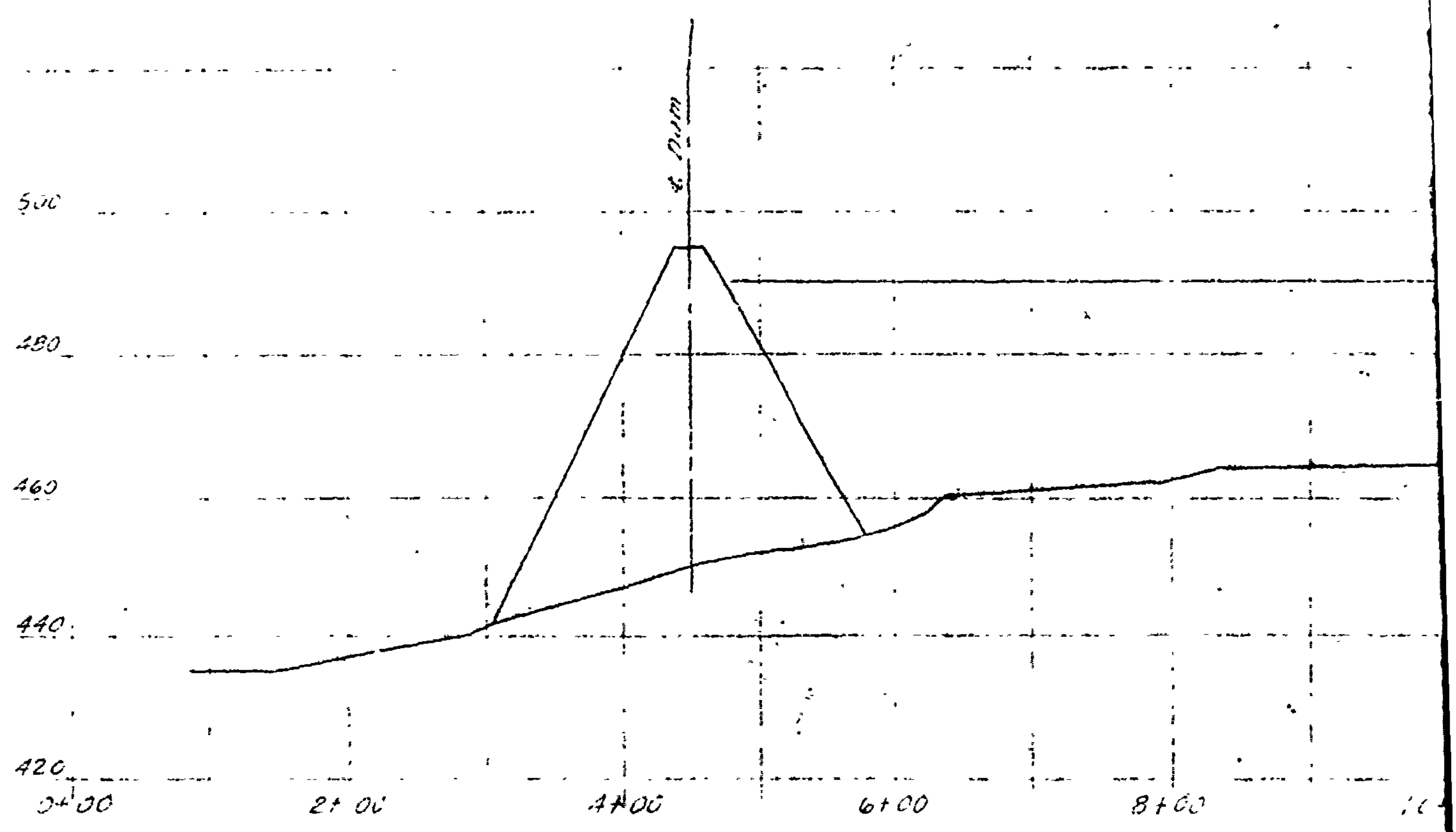
ERIALS ESTIMATE

L PIPE, 12 GA DOUBLE RIVETED, BITUMINOUS
SPHALT PAVED INVERT
A WITH WATERTIGHT BANDS ... 200 LIN FT
BEND - 3 SECTION - FABRICATED ... EA
. PIPE, BITUMINOUS COATED, 16 GA.
- PRINCIPAL SPILLWAY VENT. ... 6 LIN FT.
- GATE VALVE SHAFT - DRAIN ... 10 LIN FT
2" DIA BARREL - 6" DIA BRANCHES ... 1 EA
. PIPE, 16 GA, PERFORATED BITUMINOUS COATED
- TOE DRAINS ... 600 LIN FT
E, 12" DIA, 12 GA ... 95 LIN FT
ATES, 4" x 4" x 3/8 ... 3 EA.
VE, 12" DIA W/EXTENDED ROD. ... EA
... 14.6 CU YDS
G STEEL ... 672 LBS
P RINGS - CORR METAL 14 GA (FABRICATED) 2 EA
ITH FILTER BLANKET ... 1745 SQ YDS

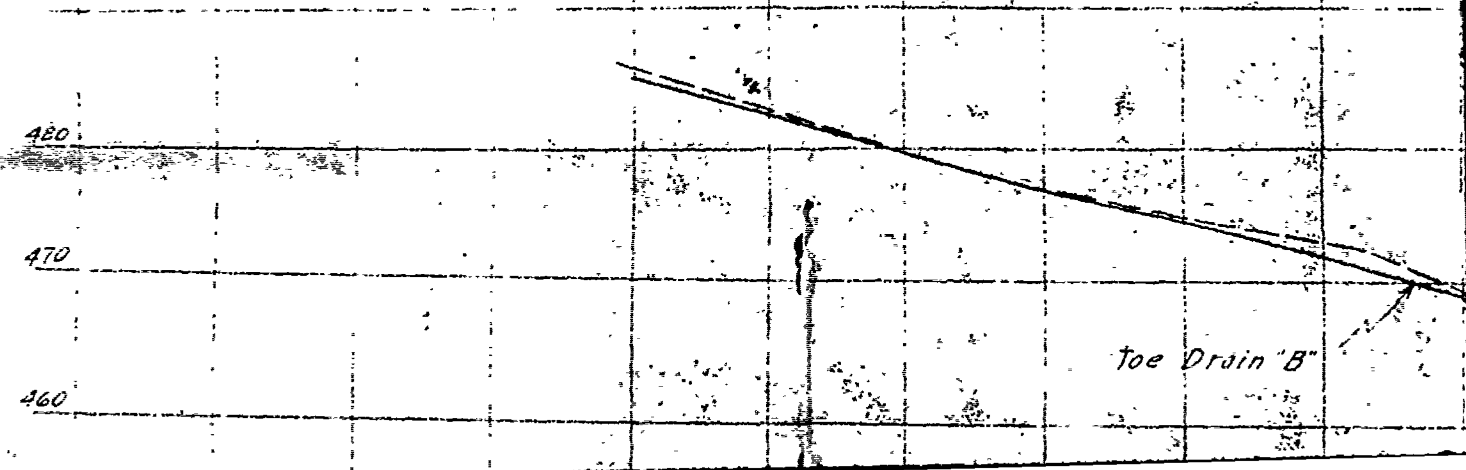
HERALD TRIBUNE
FRESH AIR FARM POND
FISHKILL, NEW YORK

U S DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
H H BENNETT, CHIEF
REGION I - NORTHEASTERN REGION
AUSTIN L. PATRICK - REGIONAL DIRECTOR
ASSISTING
DUTCHESS COUNTY, N.Y.
SOIL CONSERVATION DISTRICT
6

ENGINEERING APPROVAL H. S. Atkinson	CARTOGRAPHIC APPROVAL
DESIGNED BY G. W. Grubb	DRAWN BY J. Hrinko
CHECKED BY H. G. Brehm	DRAWING NUMBER P-1245
DATE April, 1951	SHEET 4 OF 6 SHEETS

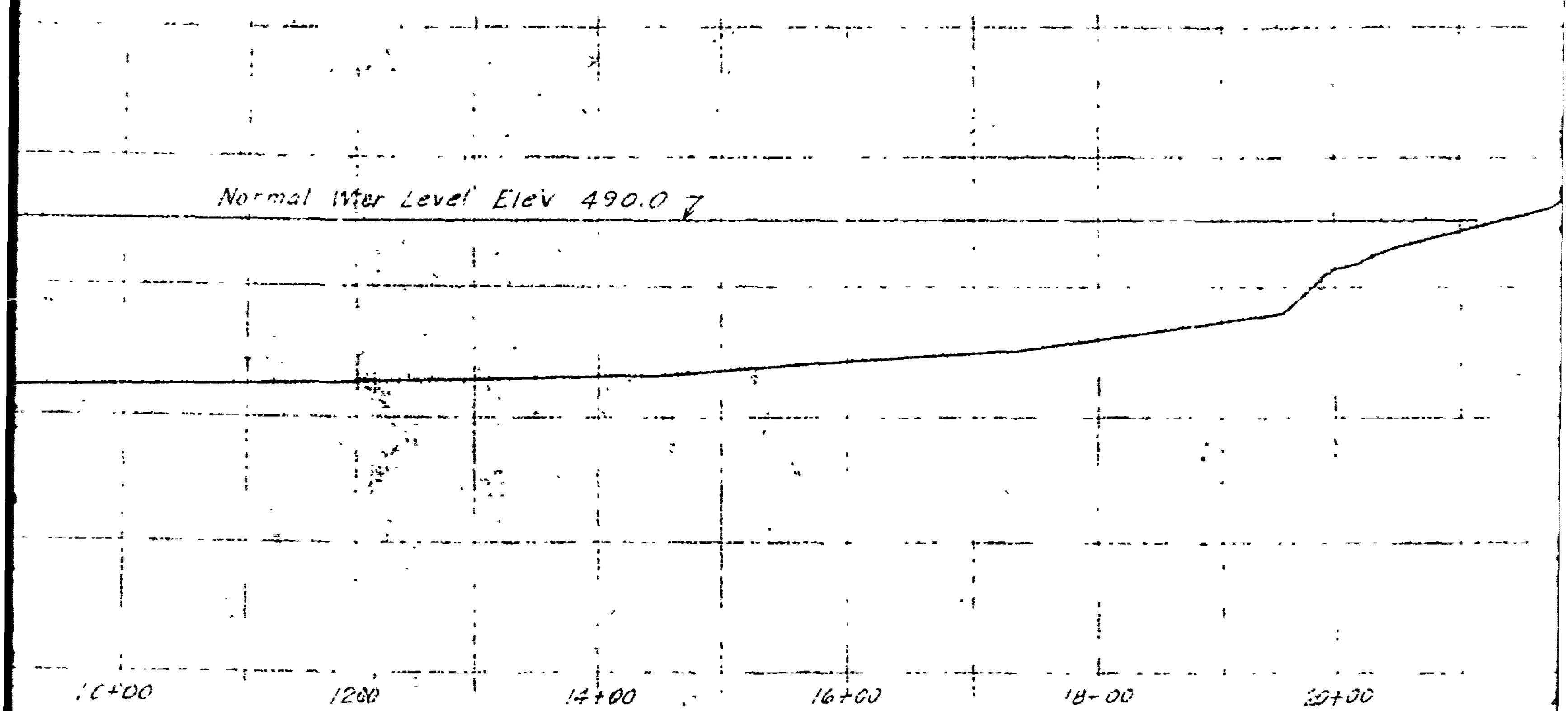


℄ Dam
500
480
460
440
420
0+00
2+00
4+00
6+00
8+00



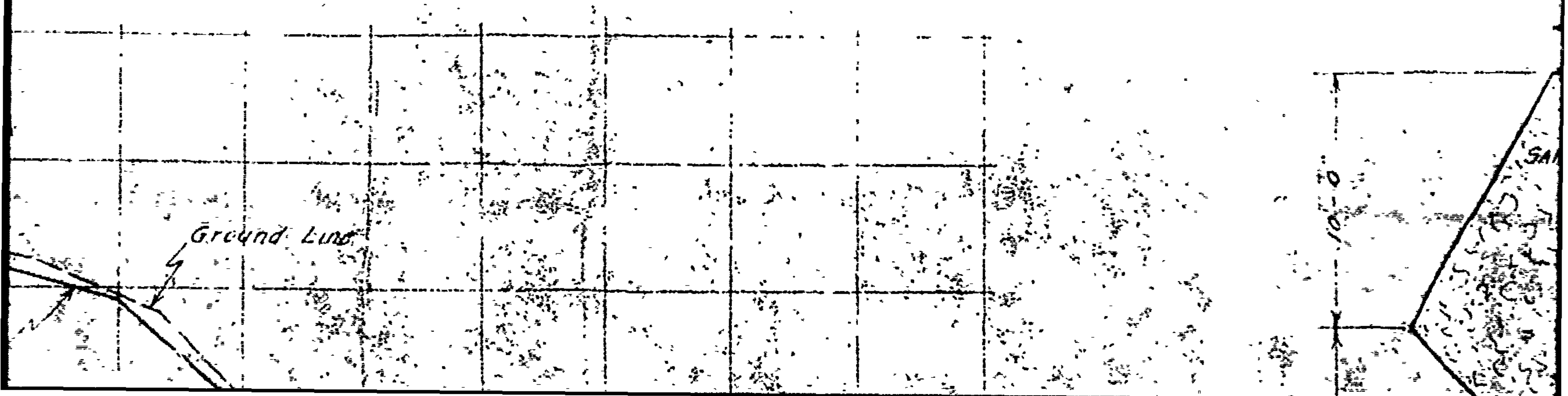
480
470
460
Toe Drain "B"

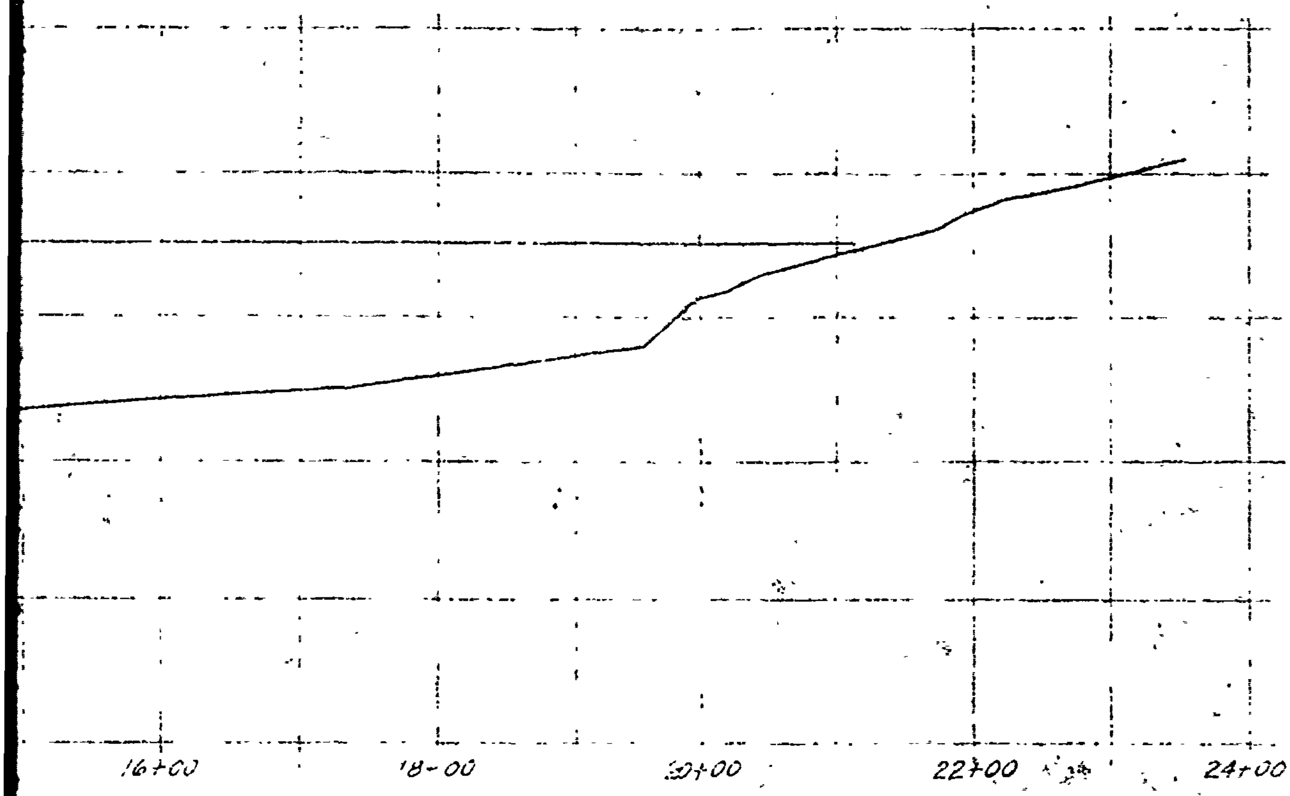
2

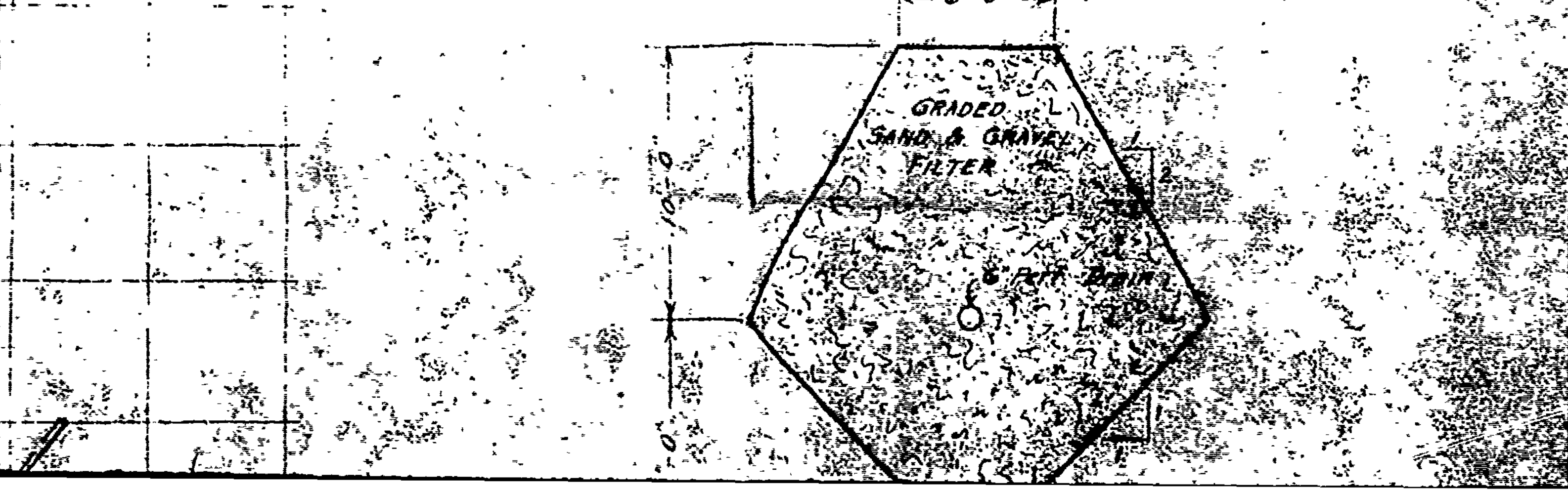


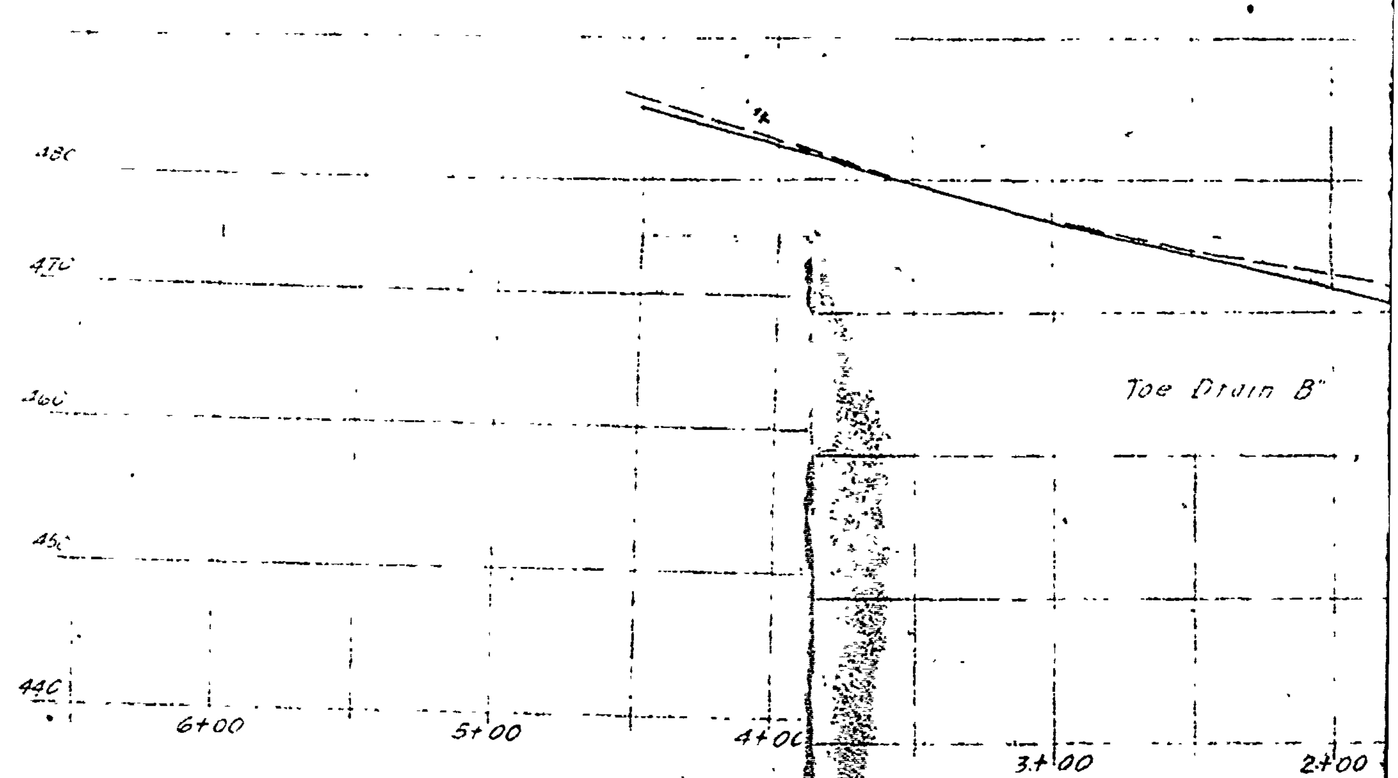
PROFILE OF POND

Scale Hor 1" = 100 Vert 1" = 20'




16+00
18-00
20+00
22+00
24+00


6'-0"
GRADED
SAND & GRAVEL
FILTER
6" Perf. Drain
10'-0"

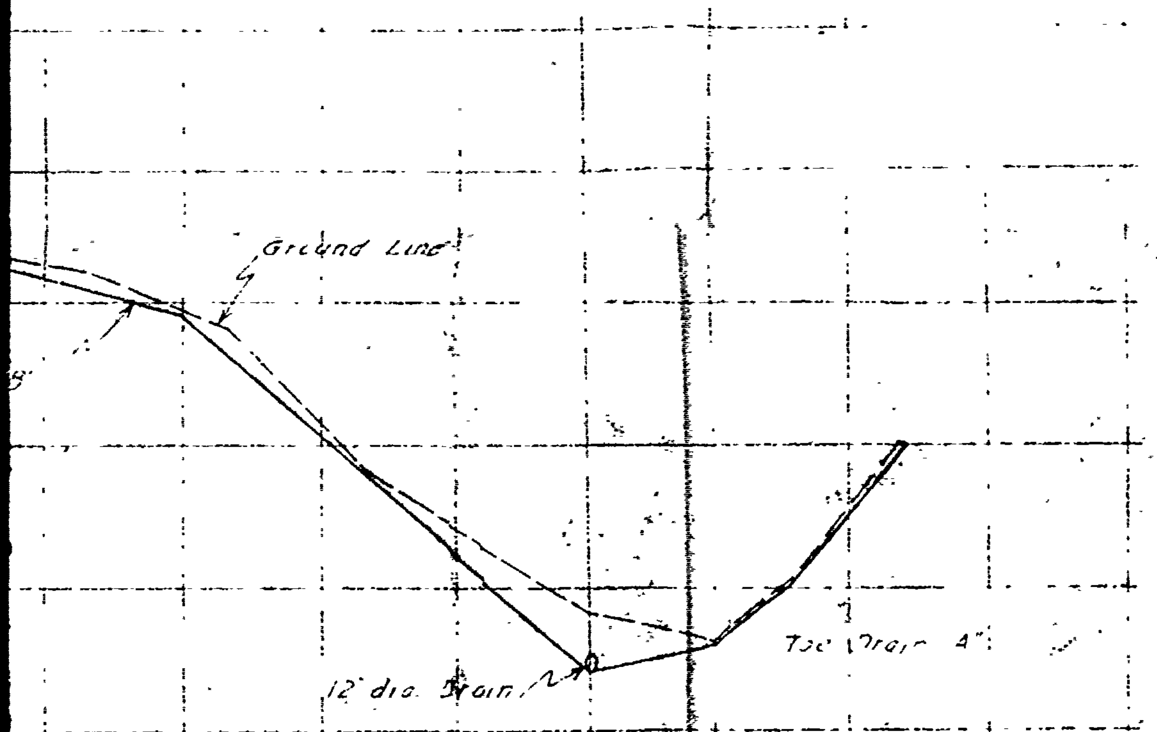


PROFILE OF TOE DRAIN

Scales - Hor 1" = 50' Ver

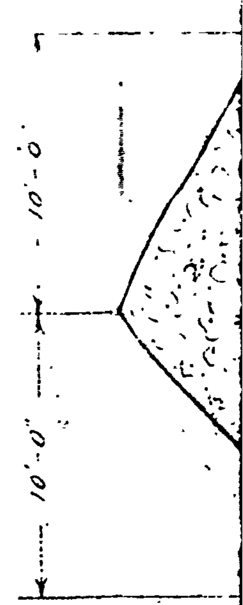
PROFILE OF POND

Scale Hor. 1"= 100 Vert 1"= 20'



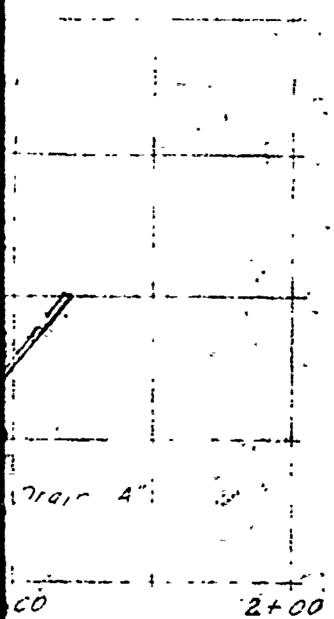
RAINS "A" & B

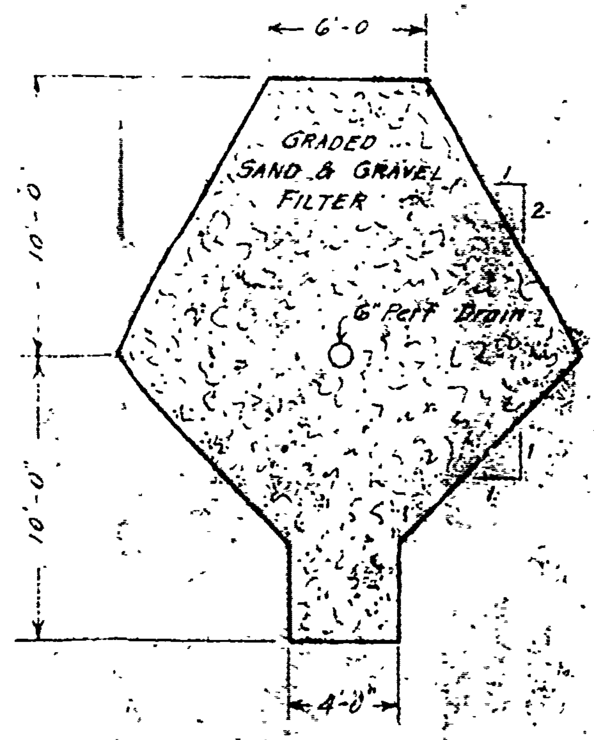
Vert 1" = 10'



DETAIL OF FI

Sc

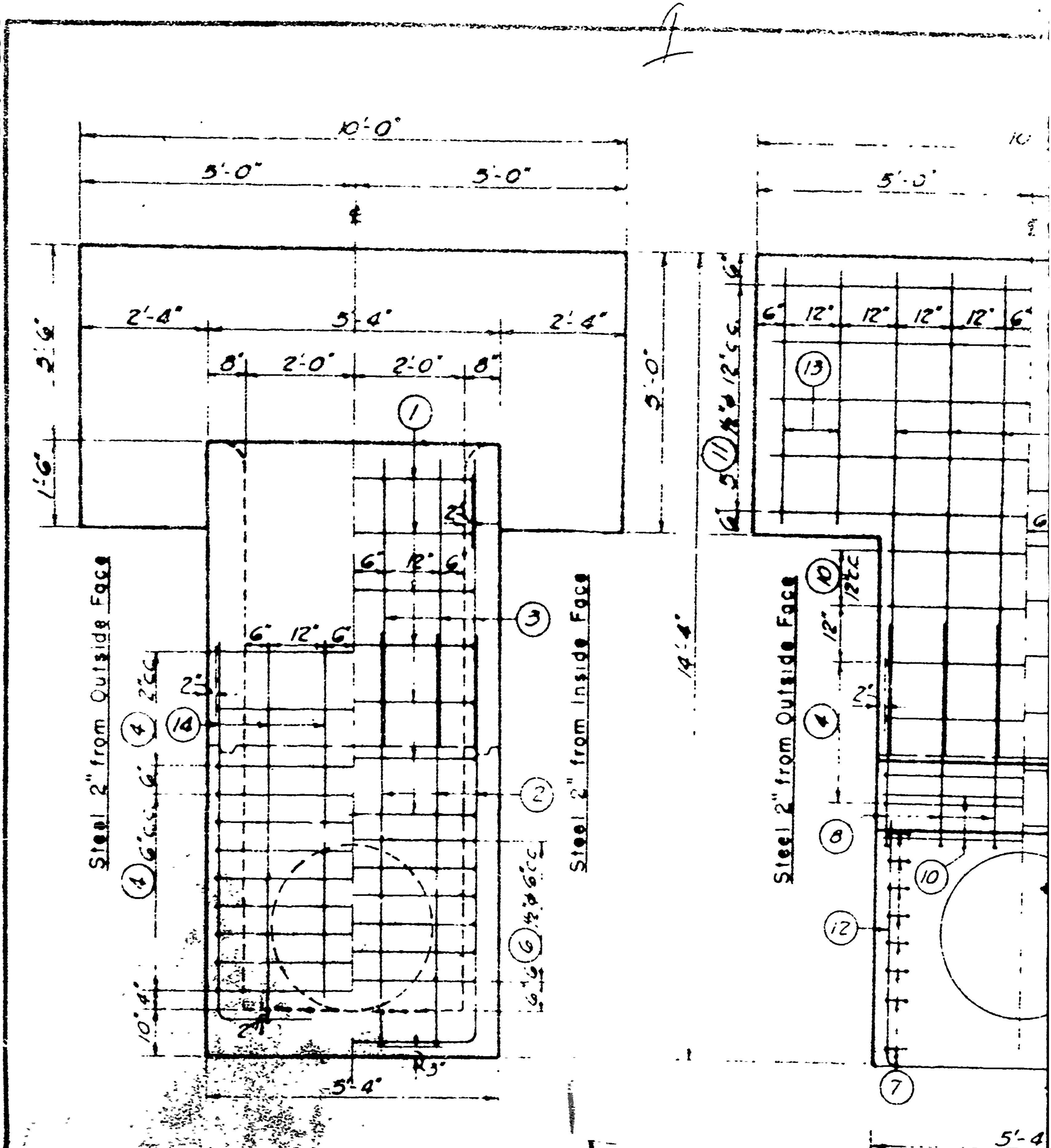




DETAIL OF FILTER FOR TOE DRAINS
Scale - 1" = 5'

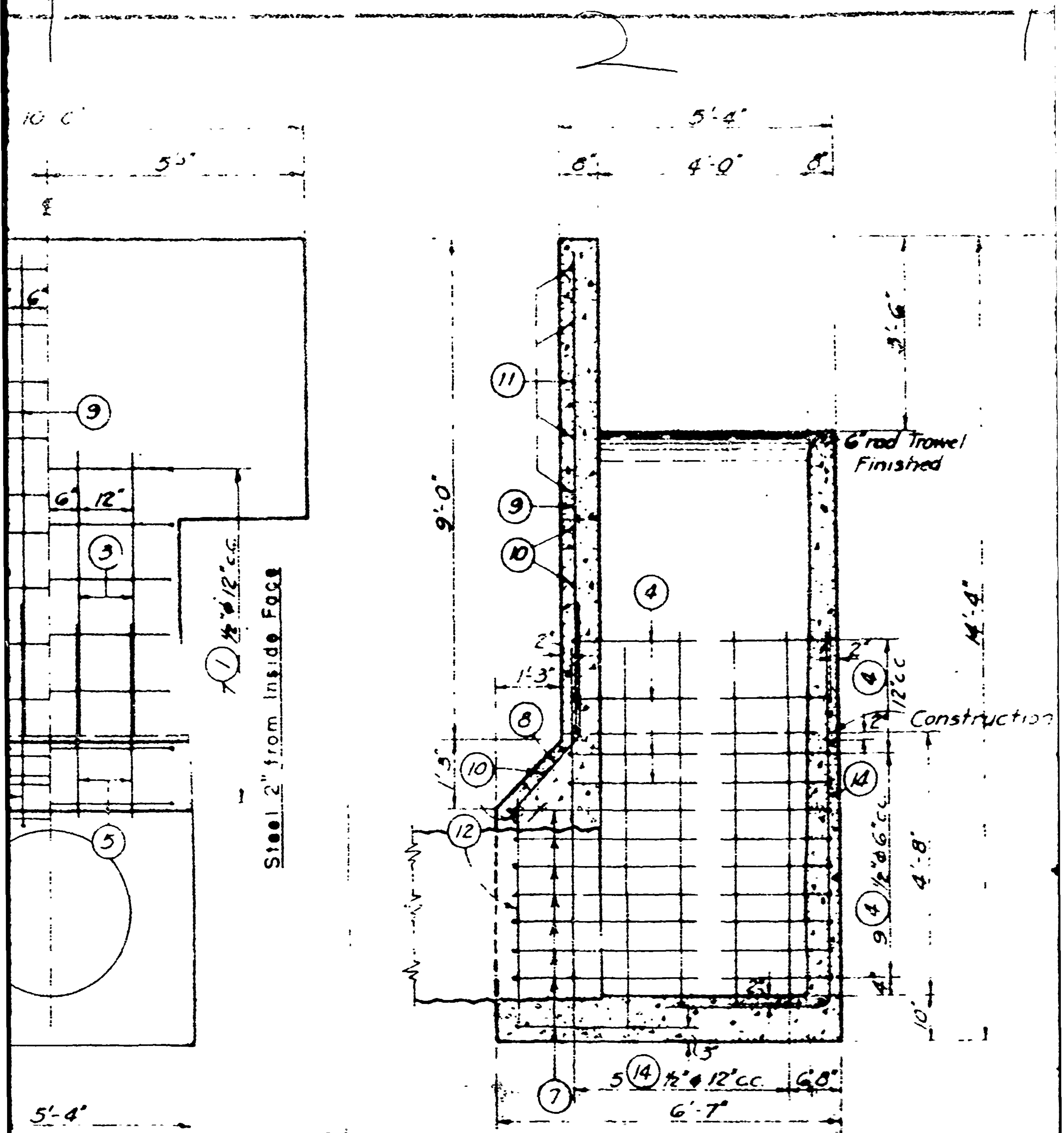
HERALD TRIBUNE
FRESH AIR FARM POND
[illegible], NEW YORK

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE



FRONT ELEVATION

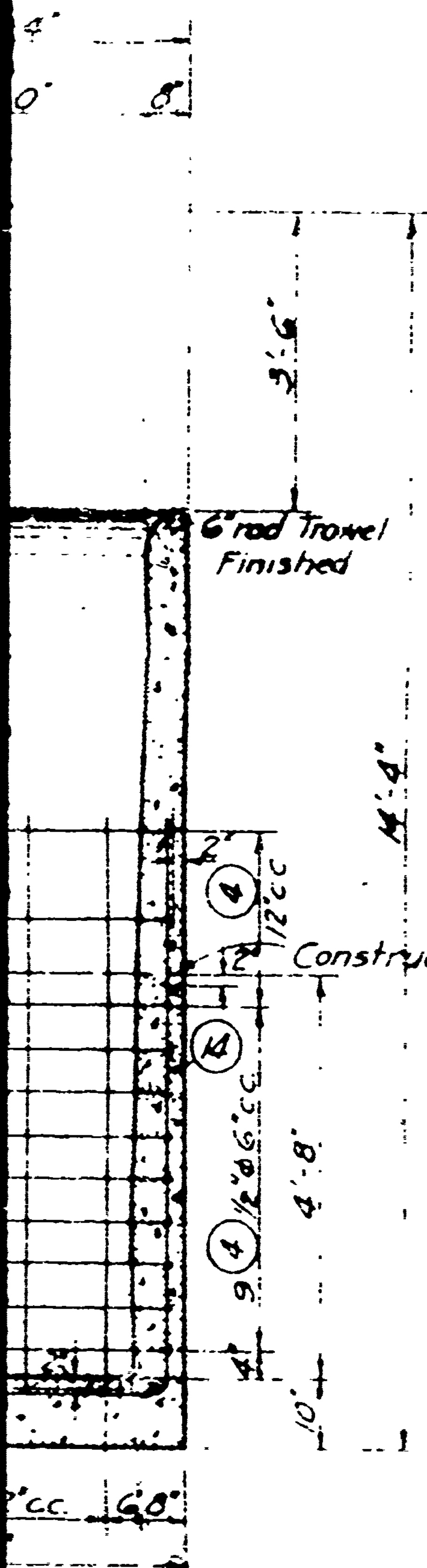
REAR ELE



ELEVATION

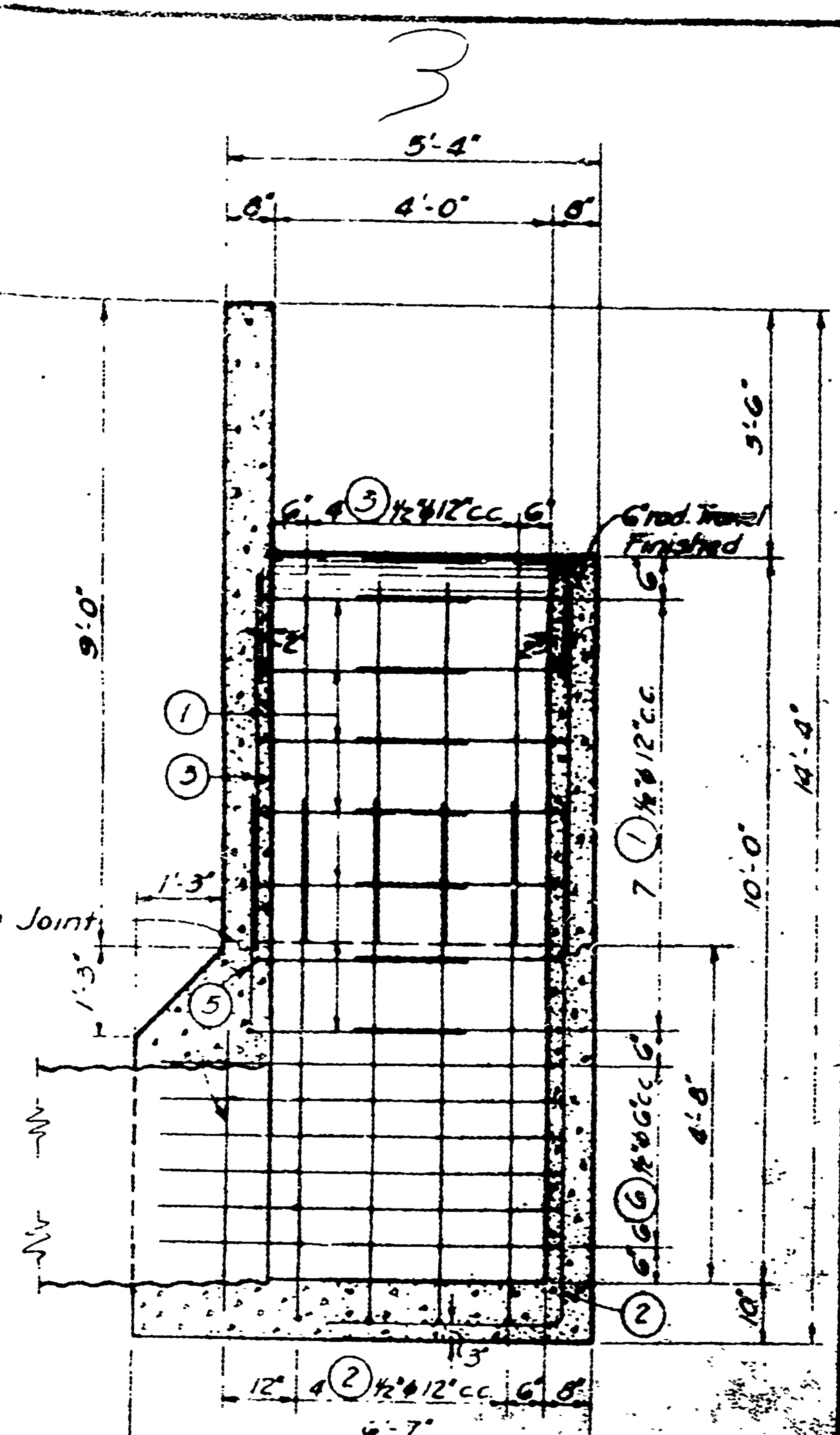
SECTION ON CENTERLINE

Steel 2" from Outside Face



ENTERLINE

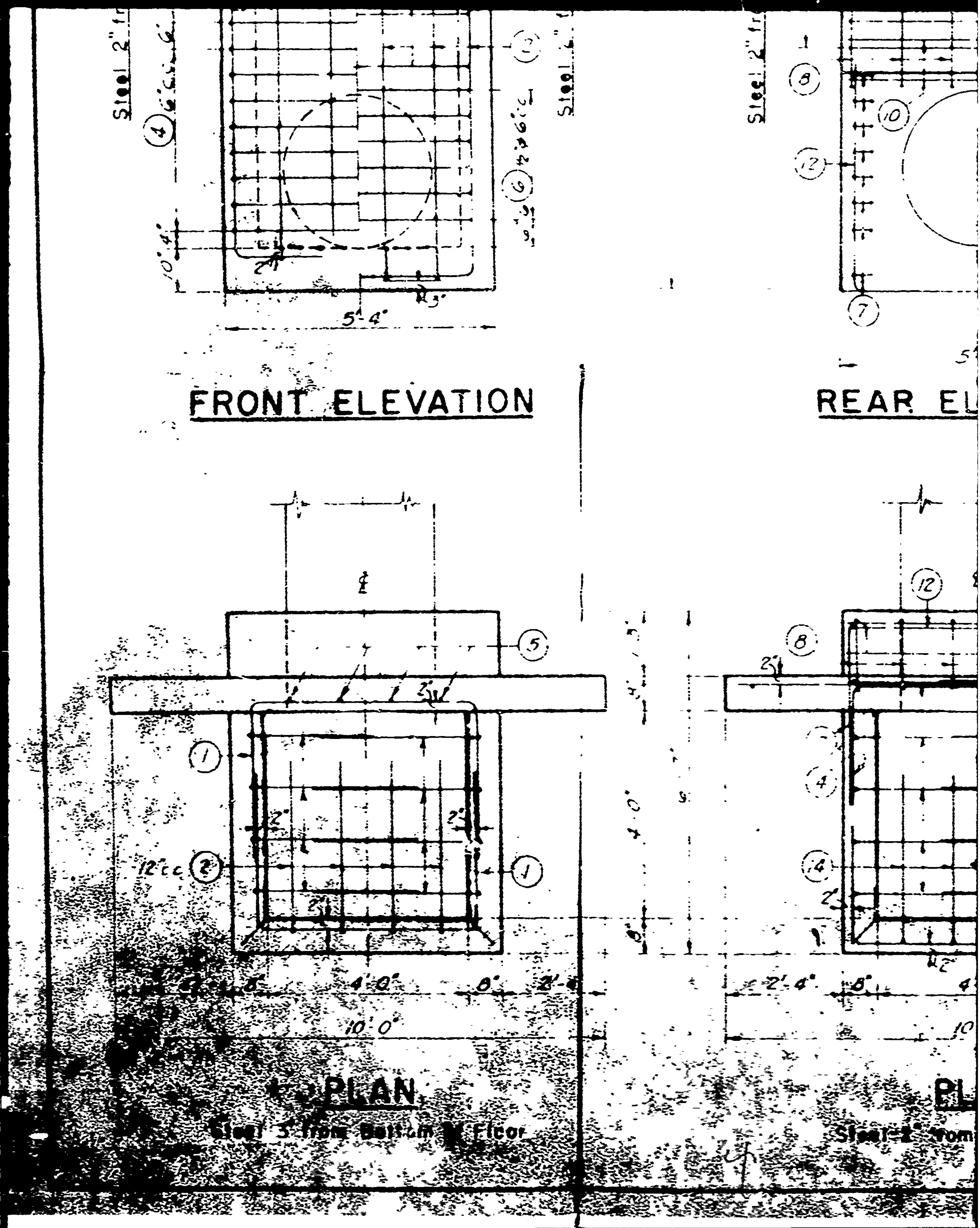
side Face



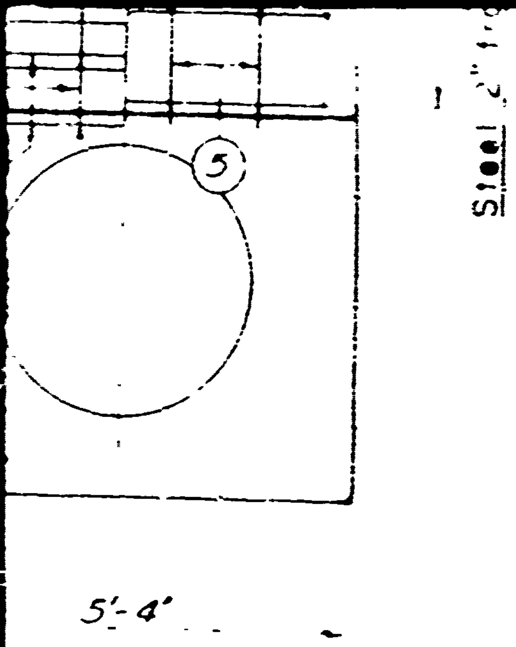
SECTION ON CENTERLINE

Steel 2" from Inside Face

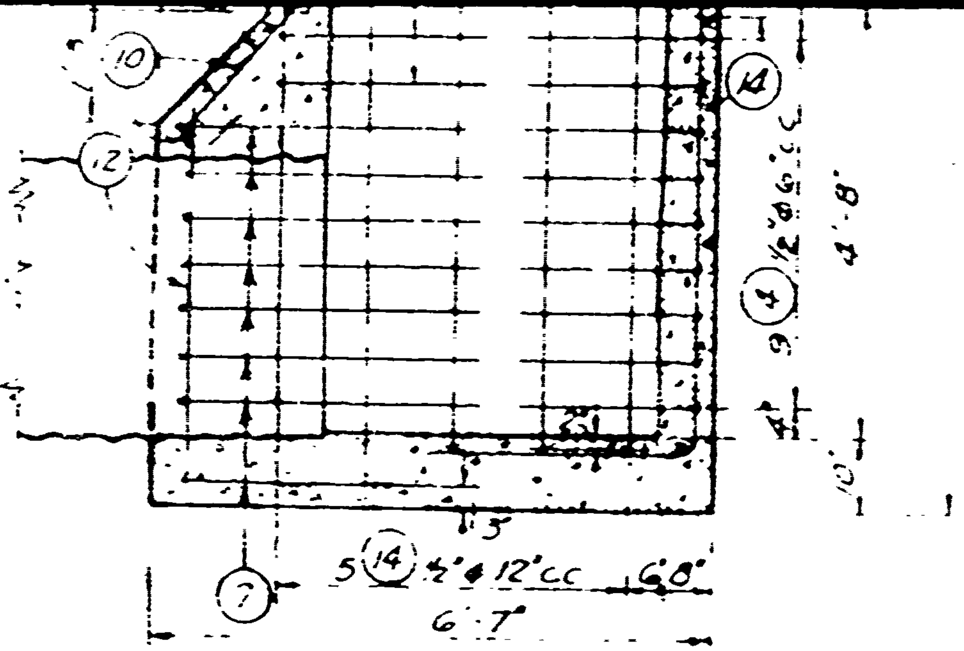
STEEL SCHEDULE


Steel 2" fr
Steel 2" fr
5'-4"
FRONT ELEVATION
REAR EL
4'-0"
10'-0"
2'-4"
PLAN
Steel 3" from Bottom of Floor

Corr Metal Diaphram

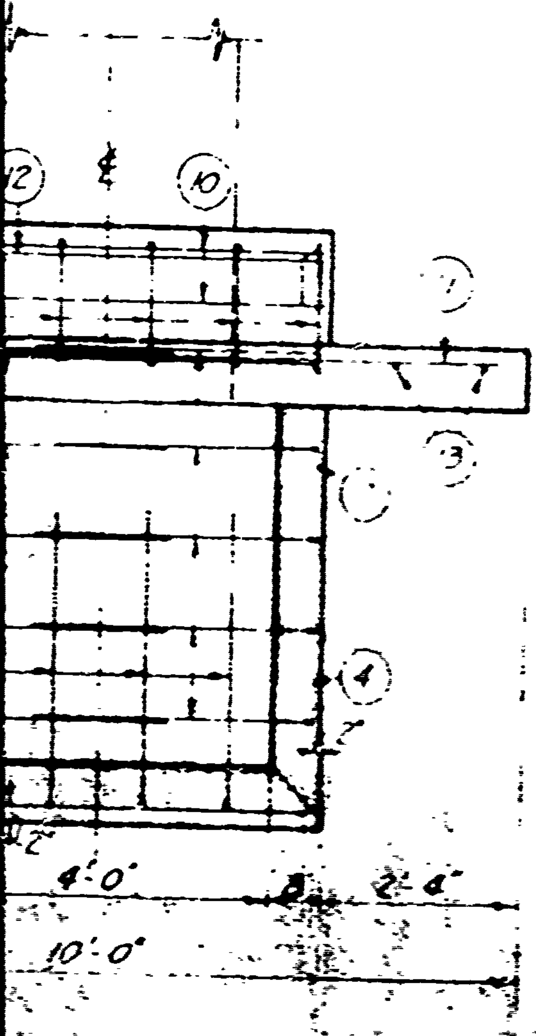


ELEVATION



SECTION ON CENTERLINE

Steel 2" from Outside Face



PLAN

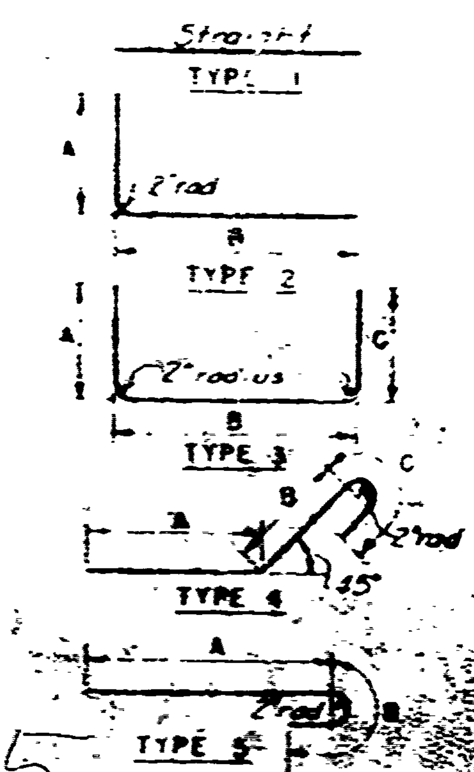
from Top of Floor

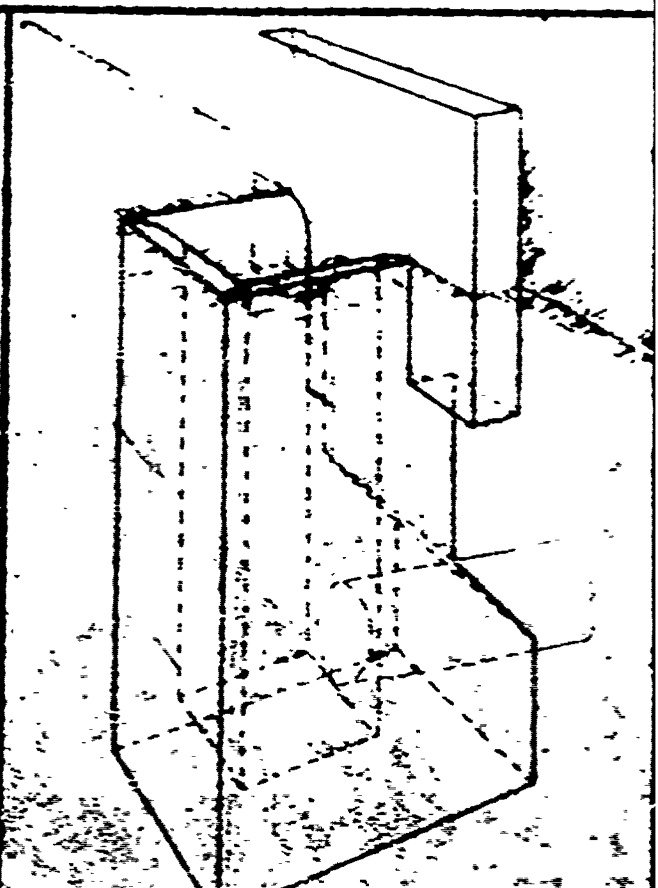
QUANTITIES

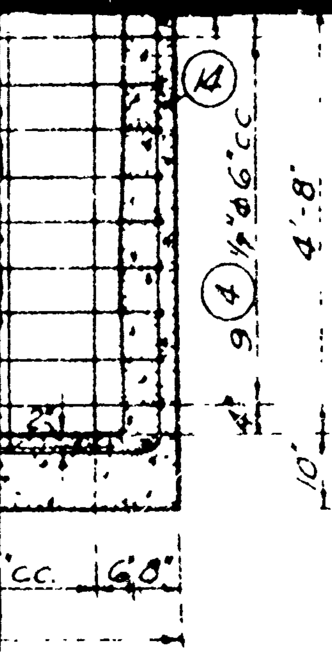
VOLUME OF CONCRETE 6.3 CU

TOTAL WEIGHT OF STEEL 672 PO

BAR TYPES

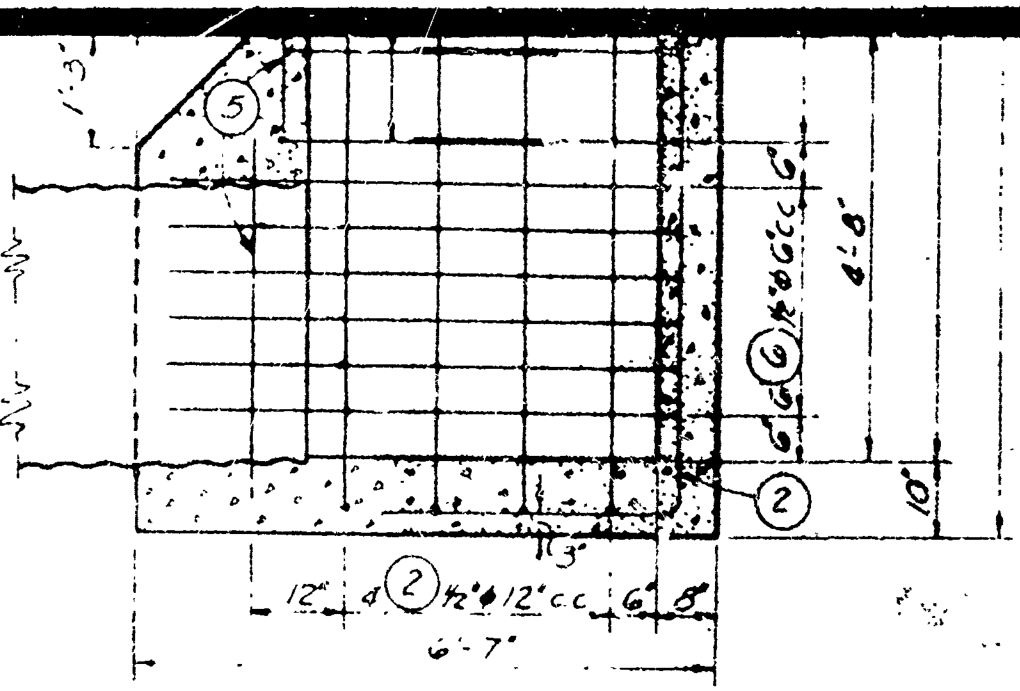






NTERLINE

side Face

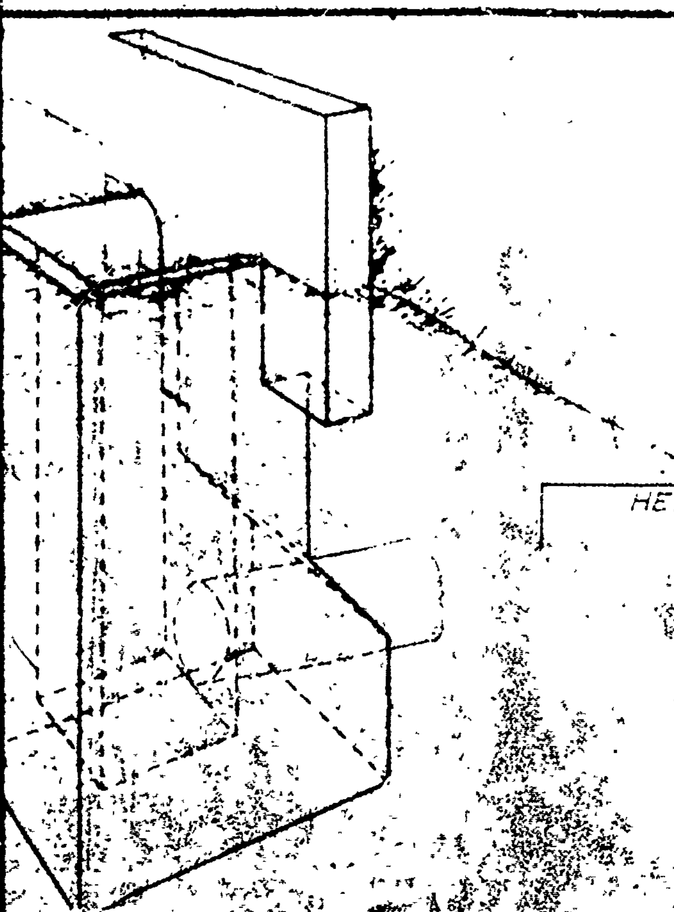


SECTION ON CENTERLINE

Steel 2" from Inside Face

QUANTITIES

VOLUME OF CONCRETE 6.3 CU YDS.
TOTAL WEIGHT OF STEEL 672 POUNDS



STEEL SCHEDULE

MARK	QUAN.	SIZE	LENGTH	TYPE	A	B	C	TOTAL FEET
1	14	½"⌀	10'-6"	5	3'-0"	4'-6"	3'-0"	147'-0"
2	12	"	10'-6"	2	7'-3"	3'-3"	-	126'-0"
3	16	"	5'-0"	1	-	-	-	80'-0"
4	15	"	9'-6"	3	2'-3"	5'-0"	2'-3"	142'-6"
5	6	"	3'-6"	1	-	-	-	21'-0"
6	6	"	16'-0"	3	5'-9"	4'-6"	5'-9"	96'-0"
7	16	"	4'-6"	5	3'-6"	1'-0"	-	72'-0"
8	6	"	5'-3"	4	2'-6"	1'-9"	1'-0"	31'-6"
9	6	"	8'-6"	1	-	-	-	51'-0"
10	4	"	5'-0"	1	-	-	-	20'-0"
11	5	"	9'-6"	1	-	-	-	47'-6"
12	1	"	14'-0"	3	4'-6"	5'-0"	4'-6"	[illegible]
13	4	"	4'-6"	1	[illegible]	[illegible]	[illegible]	[illegible]
14	14	"	10'-0"	2	6'-9"	3'-3"	[illegible]	140'-0"

REINFORCED CONCRETE-BOX TYPE INLET FOR PRINCIPAL SPILLWAY

HERALD TRIBUNE FRESH AIR FARM POND
FISHKILL, NEW YORK

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
H. H. BENNETT, CHIEF
REGION I - NORTHEASTERN REGION
AUSTIN L. PATRICK — REGIONAL DIRECTOR
ASSISTING
DUTCHESS COUNTY, N.Y.
SOIL CONSERVATION DISTRICT

ENGINEERING APPROVAL	CARTOGRAPHIC APPROVAL
[illegible]	
DESIGNED BY: G. W. Drabb	DRAWN BY: J. Hinke
CHECKED BY: H. G. Brahm	DRAWING NUMBER: [illegible]
DATE: [illegible] 1951	